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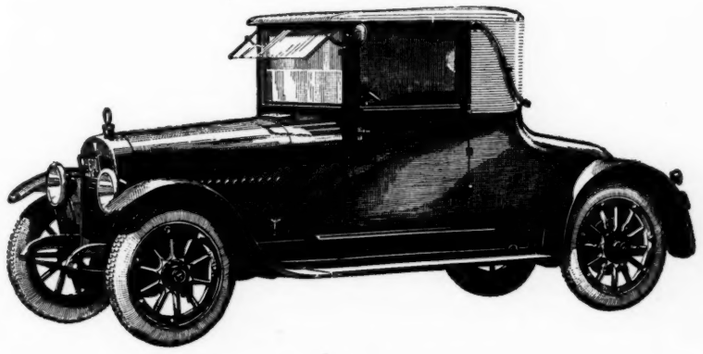

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AUTOMOTIVE INDUSTRIES
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Aircraft Chaos Works Injury To the Nation

Borglum Charges Must Be Cleared Up Soon—Congressmen and Senators Too Eager for Rumors

By Allen Sinsheimer

WASHINGTON, May 14.—There is chaos in the public mind as regards the airplane situation. A speedy and efficient investigation, minus the present brass-band methods, is needed to steady the public mind and to again create that degree of optimism which the Liberty engine and the airplane program merit.

The Borglum airplane babble continues to hold the front sector here. The general public continues to guess at the meaning of it all, and to wonder where the stigma of scandal will finally settle. The War Department, late last week, made a counterattack with a series of letters and documents intended to show that Gutzon Borglum is actuated by selfish motives. The sculptor called this attack a smoke screen, designed to hide the investigations instigated by him. There have been charges and counter charges, attacks and denials, rumors and semi-official reports unceasingly, until to-day there are very few similar views on the situation.

The week commenced with a letter, published in the last issue of AUTOMOTIVE INDUSTRIES, by Borglum, which had been read into the *Congressional Record*, and denied that Borglum had any interest in airplane companies. At the time the letter was meaningless. Following the publication of the letters and documents by the War Department it took on a meaning, and showed that Borglum had prior knowledge of the War Department attack.

The letters and documents filed by the War Department with the Senate tend to show that Borglum attempted to take advantage of letters from President Wilson, which he interpreted to grant him official authority as an investigator, by participation in a new aircraft company, with his Presidential influence for his asset. The letters, and a statement by Kenyon Mix of the Dodge Mfg. Co., Wisconsin, tend to show that Borglum negotiated for the organization of a new airplane company, with which he was not to be openly associated, but was to be represented by Benjamin Harris of New York. Some of the letters filed and signed by H. H. Suplee, consulting engineer for the Dodge company, are to the effect that Borglum discussed the possibility of securing government data and plans for the new concern through his influence.

Mr. Mix stated that he first believed his negotiations with Borglum proper, but later became suspicious, and laid the facts before Howard E. Coffin, then chairman of the Aircraft Production Board, who called in officers of the Signal Corps to hear the testimony. This occurred in January, months before Borglum filed his report and made his public accusations. It explains why Col. E. A. Deeds of the Signal Corps, and others severely criticised in the report, have been retained in their positions.

Borglum had branded the charges against him as lies. He charges Mix with being a tool for Colonel Deeds, whom he has bitterly accused.

Hugh Gibson, assistant in the British Munitions Commission purchasing department, and named with Borglum in the letters, states that Borglum severed all negotiations for the prospective aircraft company when he received the letter from President Wilson which he interpreted to constitute him an official investigator. In a recent letter, Borglum charges that Secretary Newton D. Baker heeds advisers of pro-German tendencies. He accuses Gen. George A. Squier, Mr. Coffin, Colonel Deeds and Colonel Montgomery of hampering the airplane investiga-

tions and of "wantonly abusing" the confidence of the people. So far as is known, despite his many accusations, Borglum has not yet made specific statements setting forth in detail any actual attempts at profiteering or purposeful delays of production.

The Senate Military Affairs Committee will continue its investigations of the airplane program despite the evidence against Borglum. Two committees will be appointed, one investigating the aircraft program, the other the cross license agreement of the Aircraft Manufacturers' Association. Senator Chamberlain stated that the quarrel between Borglum and the War Department has no influence on the committee, which is interested only in the expenditures of the airplane appropriations and the airplane delay. The committee has had some delay, due to a temporary obstacle created by the failure of the Committee on Contingent Expenses to authorize the investigation. The committee is apparently trying first to learn if the War Department sanctions the investigation before it authorizes. The Department of Justice, also examining the Borglum report, has not yet determined if it will devote any attention to him personally, since he is not a Government official.

One of the queries raised about the War Department exposure of Borglum is why this exposure was not made sooner, since these letters and documents have been in government hands for several months. This question is even regarded seriously by many friendly to the War Department.

Was Little Known Before Accusations

The answer is obvious. Until Borglum hurled his public accusations into the Senate he was little known, and unimportant, and had committed no act that warranted the time of the Senate, War Department and public which was taken up by the introduction of the evidence against him. To have introduced this evidence at an earlier date would have caused a loss of its effectiveness. Furthermore, it is quite likely that Mr. Coffin and the others who gathered the testimony may have considered Borglum the official investigator he claimed to be, and feared to introduce this testimony against him, since it would have been embarrassing had Borglum been an official investigator to the President.

Further evidence of the need for truthful publicity was displayed again this week by a perverted news story, given wide publicity, to the effect that the Bristol airplane equipped with the Liberty engine, and planned for large manufacture, has been "practically abandoned" because "the radiation of the Liberty engine was faulty and the trials showed that the motor became overheated in attempting to keep up the power necessary to propel the heavy plane." The story went on further to say that attempts to modify the engine would be made. As a matter of fact, there was no fault with the engine. There was fault with the Bristol plane, which was not originally intended for Liberty engines, and which will be modified to conform to the engine. The Curtiss Aeroplane Co. has orders for 800 of these planes, and these orders have not been canceled.

In this connection, attention should be called to a letter written by Leon Cammen of New York City, addressed to Senator Brandegee, and read into the *Congressional Record*. It is a letter taking up the newspaper Bristol plane story, bitterly assailing the handling of the airplane program, and attempting technically to show why the Liberty engine is a failure. This letter, introduced by the Senator, was preceded by explanation to the effect that the Senator does not know the writer. It seems unusual that any one who can write a letter can forward it to a Senator and have it read into the *Record* without investigation. It would seem reasonable to first conduct inquiry to learn if critics are American citizens, or of what citizenship they come and by what authority they write. It would be simple for a German, anxious to discredit American activities, to write letters of criticism also.

It has been stated in Washington that the Department of Justice holds evidence pointing to a concerted German propaganda among men not connected with the aircraft production, but among outsiders, who, through widely-known organization, are attempting to discredit the government's attempt to turn out the Liberty engine. It is also stated that the Department of Justice is therefore including in its scrutiny not only the airplane officials but also those who have appeared before Congressional committees denouncing and decrying our present program.

The many charges and rumors have led to a great confusion of interpretations of the situation. There are probably as many interpretations as there are officials interested in the investigations. Chief among the views learned through interviews are the following:

1—Some believe that Borglum is entirely correct, and should secure prompt and respectful attention for his accusations. These believe that the War Department needs a thorough overhauling. Included among those who hold these views are some Republican and anti-Administration Democratic Congressmen.

2—Some believe that both Borglum and the War Department may to a large extent be correct. They believe that although Borglum's motives may not be impersonal, and may be selfish, as indicated by the War Department's evidence, that his charges are true, nevertheless, and should be investigated.

3—Some believe that Borglum is actuated by personal animus, due to the refusal of Signal Corps officials to accept his aeronautical inventions. These think that his accusations should be disregarded.

4—There is another view taken by weaving a chain of circumstantial evidence, and regarded by many as correct. These point to the various publicity propagandas and other means used by manufacturers in control of foreign airplane patents to force their planes upon the public by discrediting the Liberty engine. They point to the fact that the Liberty engine is also discredited by Borglum. They point also to the fact that one of these foreign engines, no longer considered worthy in England, and which has had a great publicity propaganda behind it in this country, is now in consideration for large contracts. This is the Sunbeam engine of the 200 hp. size, and which, according to direct advices from officers of the Signal Corps, will shortly be ordered for installation in planes for use in the American army.

5—The last important viewpoint is that held by higher officials, who believe that while there is some slight justification to the charges of delay in the airplane program, that this is really all that is correct in the Borglum report. These think, however, that the uproar and confusion in the public mind must be cleared, and they urge a prompt and quiet investigation, made public in detail when it is completed.

Stripped of all the confusing rumors and side issues, the real crux of the matter seems to lie in a competent and open investigation of the entire situation. If Borglum knows, as he claims, many more important facts regarding the delay and so-called graft, the Department of Justice should take him in hand and secure his information, and then make its investigation. The present system, including the brass-band methods and the childish arguments, works great harm.

On one hand, witness Borglum rushing to Washington,

making only a simple denial to the War Department's evidence against him, promising more facts in the near future, and rushing away again to issue more letters from New York and Connecticut.

Witness the Senate spending many valuable hours discussing the Borglum promises and the letters from unknown writers.

Witness the officials who have been accused of dishonesty and traitorism trying to work efficiently and intelligently while at the same time resting under suspicion, just or unjust.

The whole matter works only harm in its present handling. It creates delay. It creates waste of time. It creates inefficiency. It creates waste of money. It creates a loss of confidence of the public. As it stands to-day, it merits the Iron Cross—it is working only to the profit of the enemy. We need a speedy, thorough, open investigation, and we need it now!

Many Delays in British Aircraft Program

NEW YORK, May 15—Some conception of the delays Great Britain is having in the development of airplane engines and the length of time required from the time an engine is designed until it is in production is contained in the 1917 Report of the British War Cabinet in the chapter dealing with the air service.

Speaking of the time necessary for the development of an engine, the report shows that from the date of the conception and design of an airplane engine until the delivery of the first engine in a series on the production basis, more than one year elapses. The period between the conception and design of a plane for which an engine may be intended until it starts series production is about 6 months.

This expression from the British Air Service adds quite some encouragement to our own Liberty engine program as well as to the development of the DeHaviland plane for the engine. The design and conception for the Liberty engine dates from June, 1917; parts for the first sample engines having been made in over twenty factories were assembled July 4 at the Bureau of Standards, Washington, D. C. Two engines were assembled at that time to see if the parts would go together without interference—and from that date onward the development of the engine took place.

What America Has Accomplished

It is now May 15, scarcely 11 months later, and two factories are in production on Liberty engines. Packard is producing 18 to 20 a day and has been in production for several months. One other factory produced 150 during the month of April and will produce double or more this month. Another factory has already produced 1000 other aviation engines and after building a new factory, and fitting it with machinery and rearranging it to build the Liberty engine, after having built 1000 Hall-Scotts, will soon be in production.

This program of American progress is one that answers the thousand critics who have been saying we should have taken up the manufacture of European types of engines in order to save time.

As mentioned in AUTOMOTIVE INDUSTRIES recently, we are now building more Liberty engines than all of the British factories are producing Rolls-Royces. This is largely due to the fact that the Liberty engine has been designed for production in American factories, whereas European engines have been designed for production in European factories. It is conservative to state that to-day we are further advanced in aviation engine production through the Liberty engine policy than if we had attempted to put into production some of the existing European types.

The following quotations taken from the British War Cabinet Report shed some light on the difficulties of aviation production in England:

"The brilliant part played by the Royal Flying Corps and the Royal Naval Air Service in the battles of the Somme, Vimy, Messines and Ypres has been described by the Commander-in-Chief, who has also borne frequent testimony to the inestimable value of the work performed daily and nightly by the two air services.

"It is fair to say that not even the well-known superiority of our airmen over those of the enemy would have enabled them to have earned the Commander-in-Chief's praise in so unstinted a measure unless they had been supplied with satisfactory machines and equipment from home. It is rather the fashion to criticize the quality of our machines.

"Most of the critics, however, are ignorant of the technical and manufacturing difficulties which have to be overcome in order to keep up a constant and increasing supply of the most up-to-date machines. Not only are the technical difficulties and the resultant research and experimental work formidable in themselves, but the task of building up in war time, without seriously affecting the requirements of other services, a new industry of a most highly skilled character necessarily puts a heavy strain upon the organizing and manufacturing ability of the country. The growing realization of the increasing importance of aviation as an artificer of victory has recently been reflected by the concession of first priority to labor and materials required for aircraft production.

Constant and Rapid Development

"The nature of the duties performed by the Royal Naval Air Service, both in conjunction with the fleet and from naval bases, makes secrecy essential to success. It is, unfortunately, inevitable, therefore, that the public should remain in the dark on this subject; but the Germans, who in this matter are perhaps the best judges, have good reason to know and to regret the great and growing activities of the Royal Naval Air Service. All that has been said regarding the difficulties of supplying the requirements of the air forces operating over the land applies equally to the supply of those which operate over the sea. In both cases difficulties are being overcome and the outlook is improving.

"The science of aeronautics is in a state of constant and rapid development; improvements in engines, aeroplanes and their numerous accessories are constantly being worked out. But the interval between the discovery of an improvement and its introduction into the service is, owing to technical considerations, very much longer than is commonly supposed. Experience shows that, as a rule, consequently, plans have to be laid for a long period ahead, and these plans are liable to be upset by many uncertain factors.

"The hopes based upon the promising results given by the first experimental engines of a new design are frequently disappointing owing to difficulties of bulk manufacture or to defects only developed after long trial in the air; new types of airplanes favorably reported on when first tried are found on longer experience not to give complete satisfaction, and yet it is impossible if we are to keep ahead in the keen struggle for aerial superiority, to wait for full experience before placing orders.

New Types Must Be Adopted

"Risks must be run, and new types must be adopted at the earliest moment consistent with reasonable assurance that they will constitute a substantial improvement on what is already in use. Orders must be placed, moreover, for considerable numbers and for delivery over many months, as the large output required for our present flying services can only be obtained by bulk orders permitting a high degree of sub-division of work.

"The next step in the problem is the balancing of the engine and the airplane programs. Owing to the much longer period required for the production of engines than of airplanes, orders for the former must be placed for relatively

long periods ahead, before it is known what types of airplanes will be required when the engines become available.

"The problem is complicated by the fact that manufacture and delivery rarely if ever proceed in accordance with anticipation. The output of a particular type may be delayed for weeks or even months owing to some technical difficulty of manufacture. Moreover, as replacement of losses and expansion are proceeding simultaneously in the flying services, and the rate of wastage in different types of engines and of planes varies considerably according to circumstances, it is impossible to forecast with accuracy what engines will be available for the equipment of new types of planes after wastage has been made good.

"Nor is it possible to any great extent to adjust the program by modifying orders once placed without disorganizing supply. The problem does not end here. Whenever a new type is introduced provision must be made for accumulating a sufficient head of spare engines, spare airplanes and spare parts of innumerable kinds to keep the squadron to be equipped with that type in a condition to make good the day-to-day wastage and carry out the constant repairs required.

"Such being the nature of the problem, it is satisfactory to be able to record that during the year 1917 not only was the number of squadrons of aircraft on the various fronts increased in a notable degree, but there was a complete replacement of machines and engines of the older types. The very great increase in output which is being obtained has placed a considerable strain on the workers in the aircraft and aero-engine factories of the country, a strain which is being met on the whole in a satisfactory manner.

"The difficulties in connection with production are aggravated by the competing claims of many different types of aero-engines. Standardization is the ideal, but is obviously difficult of attainment having in view the importance of not losing time in production and at the same time of keeping abreast with the very latest developments necessitated by the need for constant increase of horsepower and higher performance.

The Air Council are most keenly impressed by the need for concentration on a few approved engines, and they have the whole question of the reduction of numbers of types under constant and careful consideration.

Importance of Keeping Workers Interested

"Attention was drawn, on more than one occasion, by manufacturers to the importance of maintaining the interest of workers in aircraft factories in the highly important but generally monotonous work on which they are employed. Engaged, as they frequently are, on the production by a repetition process of some small part of an airplane, these men and women find it difficult to realize that they are contributing effectively to one of our most valuable instruments of warfare.

"It was accordingly arranged that Captain Ewart, R.F.A., well known as a writer by the name of Boyd Cable, should visit various squadrons at the front and gather materials and photographs for lectures concerning the exploits performed with various types of aircraft for delivery to the workpeople engaged on the manufacture of those particular types. Captain Ewart delivered several series of lectures which, judging from the reports received from the factories concerned, proved a very great success."

Some indication of the extent to which female labor is being employed abroad, even on the heaviest kind of work, is given by this view of the iron foundry of the Fiat Works in Turin, Italy

Detroit Combines Red Cross with Other Activities

To Raise $7,000,000 in Novel Way

DETROIT, May 14.—Instead of having five or six campaigns every year to raise money for patriotic and philanthropic purposes, Detroit will combine these activities in one great campaign to be known as the Detroit Patriotic Fund, to be launched May 20, coinciding with the national campaign of the American Red Cross. Detroit has pledged to raise $7,000,000 during the week—a million a day. Of this amount $3,000,000 will go to the Red Cross; the balance will be divided as follows:

Y. M. C. A.	$1,500,000
Knights of Columbus	500,000
Jewish War Sufferers	325,000
American Committee—Armenian and Syrian Relief	200,000
Y. W. C. A.	150,000
War Camp Community Recreation	112,500
Salvation Army	35,000
Jewish Welfare Board—Army and Navy	25,000
Local War Funds	107,000
Community Union (42 local agencies)	661,400
Reserve Fund	500,000
Total, with Red Cross Fund	$7,115,900

The executive committee has divided the city into ten sections with a district chairman for each. The factory division, under the supervision of Witter J. Peabody, will work on the same basis as in the Liberty Loan drive and managements of plants will be asked to underwrite the contributions of employees.

A unique schedule of donations for factory workers has been worked out that is considered equitable in every way. It follows:

Salary Weekly	Donation Per Month	Salary Weekly	Donation Per Month
$10 to $15	$1.00	$42 to $45	$3.50
15 to 18	1.25	45 to 48	3.75
18 to 21	1.50	48 to 51	4.00
21 to 24	1.75	51 to 54	4.25
24 to 27	2.00	54 to 57	4.50
27 to 30	2.25	57 to 60	4.75
30 to 33	2.50	60 to 63	5.00
33 to 36	2.75	63 to 66	5.25
36 to 39	3.00	66 to 70	5.50
39 to 42	3.25		

Each of these amounts represents a half day's pay a month to be pledged. This schedule applies mainly to factory employees.

For those whose incomes are over $3,000, the following percentages of their gross incomes should be asked:

Yearly Income		Yearly Income	
$3,000	2%	75,000	8%
5,000	3%	100,000	10%
10,000	4%	200,000	12½%
20,000	5%	300,000	15%
50,000	6%		

These schedules are based on an estimated annual income for Detroit and Wayne County of $325,000,000, of which $200,000,000 is received by persons earning $3,000 and under. They are not regarded as assessments in any sense, but merely as a guide. Some will give less, others more than the schedule calls for, but if the average is maintained in each class the money can be raised.

The solicitation plan follows two different inter-related lines—geographic and functional. The geographic division of territory has ten general districts laid out in such a manner that each holds about the same number and value of prospects. Prospects will be solicited at places of business primarily. Individuals and not corporations will be the basis of solicitation, although corporation gifts will not be declined if tendered.

In charge of each of these districts is a district chairman, each of whom will have ten to twenty teams.

In the functional division, the individual givers and industrial plants are classified. The supervisor of industrial plants in conjunction with the manufacturers' committee has developed a plan for organized solicitation in factories. The primary essentials of the plan are that work be done in co-operation with the factory management. The management should be asked to assign to the team at work in any plant some official to act as a member of the team and give active help in working out details of solicitation in the factory. It is suggested that each factory team carry with it a speaker. Mass meetings should be held. The management will act as the collector for the fund, deducting the weekly pledge from the donor's wages and transmitting it monthly to the Detroit Patriotic Fund.

Subscribers may designate the war or local organizations to be benefited by their contributions and the proportion each is to receive. If anyone desires to secure Red Cross membership a plan will be submitted to him whereby he can do so.

It is essential that the factory workers have a meeting with all the foremen of the various departments of a plant. These foremen are to be the salesmen, as it is pointed out that without their co-operation a team will not know what men should give $1 a month and what men could give more. The foreman, however, knowing the earning capacity of each man under him, can facilitate matters.

Securing the co-operation of each plant is essential before the employees are solicited. After this is done, a definite date on which the plant will be worked is arranged for and the team or teams will try to work each factory with as little loss of time to the workers and as little disturbance of production as possible.

Some firms will wish to handle the drive themselves in their factory, and in many cases can do so very effectively. In this event it will be impressed upon the management that in taking this responsibility it will be responsible for the proper total amount based on the number of employees.

Advertising in sufficient quantities is being supplied; 250,000 hand-bills or folders are printed in all principal languages; 5000 factory posters; 300,000 buttons; 10,000 small emblems or stickers.

There is no way that it is possible to collect a given monthly amount from workers unless the management of each factory will collect the amount of money pledged by their employees and pay the total to the Patriotic Fund each month. This will necessitate each factory working out some way by which it can secure from its men each month the total quantity of the amount of pledges secured by the team when it worked the factory, so that the Patriotic Fund will be able to collect from each factory the same amount each month. This has been worked out at the Paige-Detroit Motor Car Co. very successfully. The number of new men employed who will be willing to subscribe to the Patriotic Fund will more than offset the number of men who will leave.

In carrying on the campaign, each worker will be supplied with a quantity of envelopes into which he will put all his pledges received in one day's work. When his envelope, containing the pledges, is sealed he will make his report on the outside and will turn it over to his chairman, who is furnished with a still larger envelope to accommodate the envelopes from all his workers. All packages from the chairmen will be put in one large envelope by the executive committee.

This Patriotic Fund campaign will be the only local campaign this year, so far as these participating agencies are concerned, unless some great war developments will force the organizations to raise more money than is anticipated. The period covered by this campaign is from June 1, 1918, to May 31, 1919.

Foreign Trade Department

South African Farmers Buying Heavily in 1918

Increased Prices Not Restricting Sales—Hupp Setting New Service Record—1918 Models Arriving Faster Than Expected—Johannesburg's Motor Boom

By M. Edward
Staff Correspondent in Johannesburg

JOHANNESBURG, SO. AFRICA, March 1.—The whole of the colonial automobile trade of British South Africa is in the hands of the United States, due to the fact that Great Britain has been practically out of the trade since the start of the war.

The problem of America now is to keep this trade.

American cars have been well suited for South African needs in that their design is adapted to a country of bad roads, streams without bridges, and great distances with sparse population. It is in this country area that the American car has succeeded in the past and established its reputation.

The British manufacturers were slow to recognize before the war—in fact, failed to recognize—that special requirements are needed for this country. British automobile representatives in Johannesburg wrote to their factories complaining, and outlining what was essential for the South African trade. The British maker was negligent, and considered that what was good enough for England was good enough for South Africa.

This situation made it possible for the American car to establish itself quickly, but undoubtedly after the war the British manufacturer will have more regard for conditions to be met in the country areas of South Africa as well as in Australia and the countries of South America.

Countries Little Affected by War

South Africa and Australia are the least affected of any of the belligerent countries, although both have helped with men and money; and from the American automobile manufacturer's point of view these colonies must be of special interest now.

Not one new car, except a few lightweight calthorpes, of British or European make, has entered South Africa except for military purposes since the beginning of 1917, and only a few motorcycles.

Consignments of 1918 model automobiles are coming unexpectedly fast considering the not very reassuring shipping news of late.

So South Africa is extremely lucky to be able to get motor cars at all, and all the motor people are happier than a month or so ago, when any arrivals of 1918 models in the near future seemed impossible. So unexpected and frequent, in some cases, have these consignments been that garages in the large towns have had to enlarge their premises, or, where space did not permit, take buildings in other parts of the city. The Buick representative in Johannesburg now owns a small town, having four large garages and workshops taking up about three blocks facing five or six streets in the motor center. He has sold 100 1918 models and is looking for new arrivals.

It is an amazing fact that in spite of the tremendously increased price of cars and parts for 1918, due to shipping and increased prices, buyers are just as keen as ever, and if sufficient cars can be brought into the country last year's car sales record will be beaten.

The Cape Colony farmers are getting better roads throughout their province this year, an extra inducement to those who see the necessity of a car. Besides, railroad expansion is to lapse owing to the deficits on the government railroads last year. All this is going to help car sales—if we can get the cars.

Farmers Use Many Fords

The agricultural population of South Africa, like that of the United States of America and Brazil, has the Ford habit. It is estimated that over 10,000 Fords have been sold since 1912, 8000 of which are still giving their owners satisfactory service.

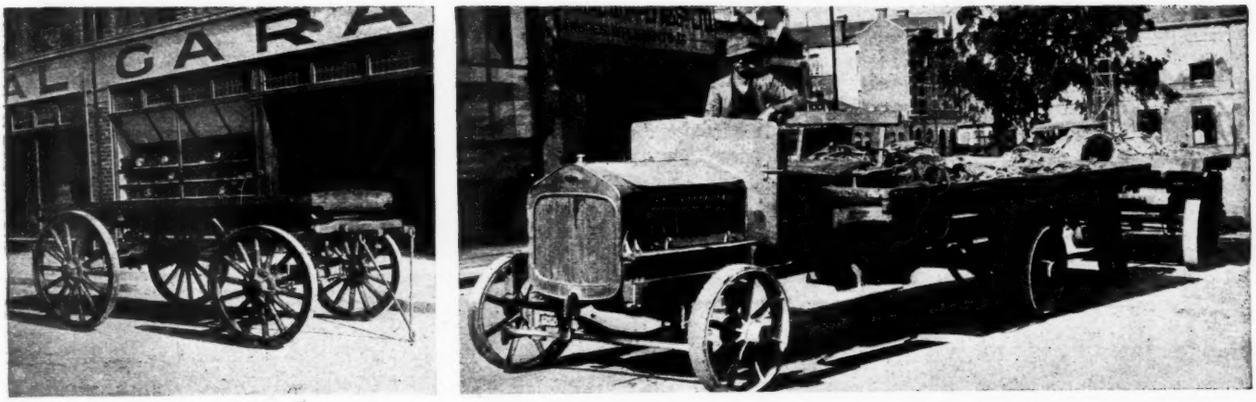
There have been no customs returns for 1918 early months yet, but about four hundred 1918 model cars of all kinds have passed customs at Cape Town and Durban, and are all practically sold or booked up. Most cars intended for Johannesburg and the interior go to Durban, the distance by rail being half that from Cape Town. If the American manufacturers can continue to supply cars the automobile position in this country will be fine. Perhaps they can for this year.

In South Africa, the American manufacturer enjoys, perhaps, an unmerited reputation for being more ready than the British maker to adapt his machine to the requirements of country such as this, but the real reason rests in the fact that the American car, developed for American conditions, is more suitable for South African conditions, which are more on a par with those in America than in England.

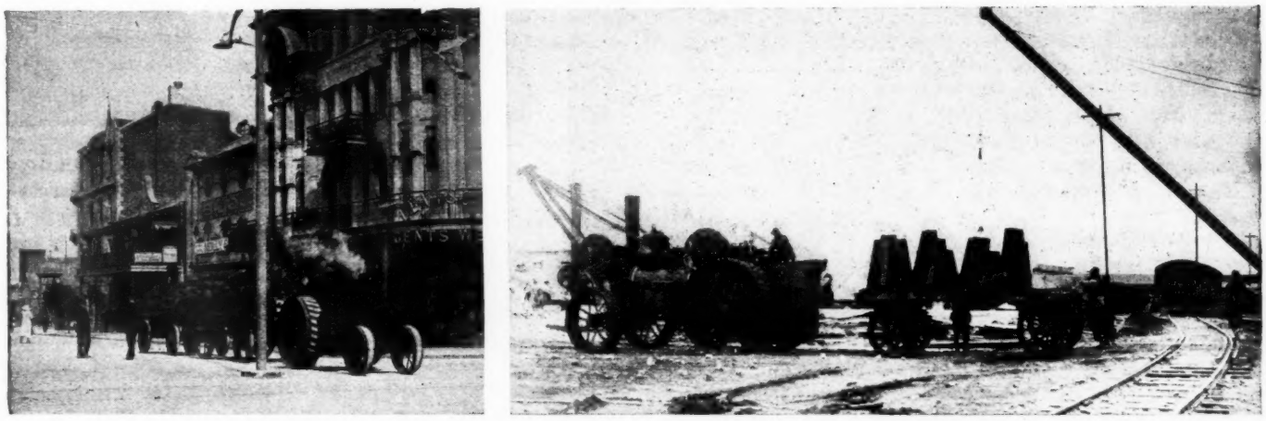
American manufacturers have lost not a little prestige in being slow to give South African dealers certain equipment they consider necessary. A case in point is installing a magneto. Hupmobile has been a leader in this movement, and this fact accounts for some of the popularity which this car enjoys in the country districts, where other cars have lost out because of not fitting the magneto.

It all lies with the American factory representative that comes over here. He can make or mar his car's sales. We have several fine and obliging men here, who are always ready to listen to the farmer's often point-

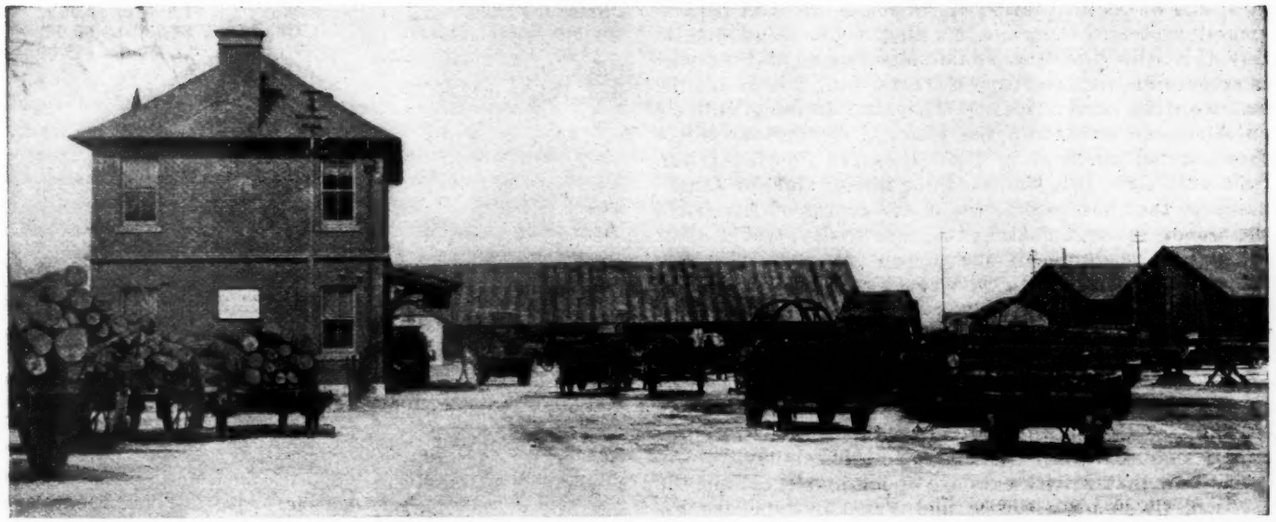
South Africa Uses Many Trucks and Trailers



Type of motor truck and trailer used by the South African Railways Co. for country and city work. One 5-ton truck hauls two to four trailers fully loaded



Steam traction engines are still used in the gold mines and by the railways to a limited extent. Few are seen in the cities, however



The South African Railways Co. uses motor trucks and trailers very extensively for hauling. This view shows a number of trailers loaded and ready

An old building, formerly a stable, which is being converted into a garage addition to house new Buicks

The "Mule Trolley" used by the South African Railways is gradually disappearing, its place being taken by trucks and trailers

Example of South African body work—an ambulance built on a Ford chassis by Messrs. B. J. Penny. This is one of twenty

Milburn electric, which has been fitted with pneumatic tires, thus greatly increasing its speed and radius

less arguments as to what would be useful for his part of the country, and we've also had the other kind, of whom the resulting decrease in Studebaker sales for a time is an example.

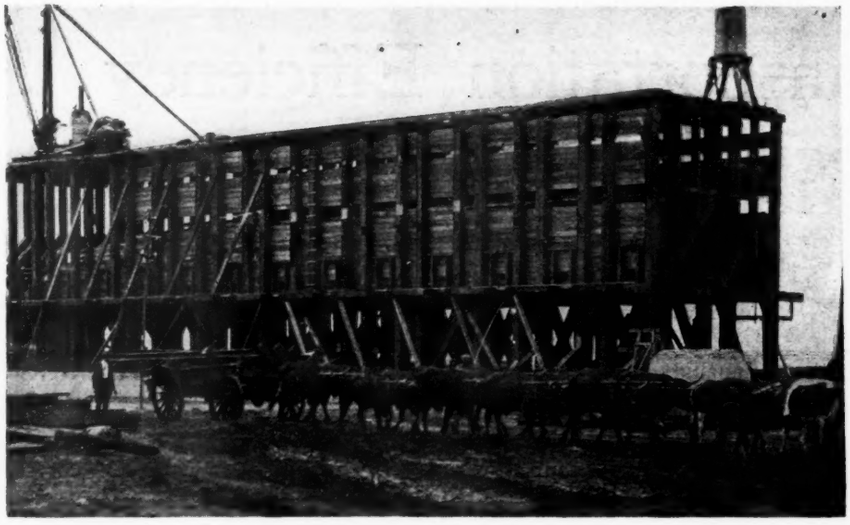
Service is a word that is just becoming known here now, due to the adaptation of American ideas in departmental system in garage running. Credit is due to Guy C. Catlin, the Hupmobile sales representative, who is responsible for the Hupp Garages, Ltd., which are the last word in service ideas. They are running entirely on American lines, and the history, right from where they started business in the haphazard South African wait-a-bit style, in a tin shanty in the old slum of Johannesburg, that has become the motor center of Africa, to the wonderful organization they are to-day, would make interesting reading—all due to pep and push of a few intelligent business men who could see that the rise of South Africa from the old ox-cart regime was imminent.

There has always been a sort of feeling, that has developed into a real prejudice, that American-made cars are cheap and unable to stand up to conditions so well as the British and European cars. This is due chiefly to the fact that it is only lately that the better-class American automobiles are coming to this country.

But now that British cars are unobtainable, cars of the Hudson, Chalmers, Cadillac and Franklin type are becoming popular, and proving themselves well up to British standards. This is going to help opinion here. A curious fact is that the increases of prices lately seem to have increased respect. Present automobile prices are:

Overland (Big Four), $2,000.
Dodge, $1,800 to $2,000.
Cadillac, $4,000 to $5,000.
Oakland, $2,400.
Scripps-Booth, $1,800. (4-cyl.)
Hupp, $2,550.
Reo, $2,500 to $3,000.
Buick, $2,500 to $2,800. (6-cyl.)
Hudson, $3,500.
Maxwell, $1,800 to $2,000.
Chalmers, $4,000 to $5,000.
Franklin, $3,800 to $5,000.
Ford, $1,575.
Saxon, $1,575 to $1,750.

Napier truck fitted with special flanged wheels, and used in the newly-conquered German East Africa



For many years, mine operators in South Africa have depended upon ox wagons such as that shown herewith for the transportation of mine supplies. Lately, however, motor trucks of 5 tons capacity, together with strings of from two to four trailers, have been slowly taking the place of the antiquated ox-drawn vehicles.

These increases on last year's figures seem out of proportion to the comparatively small rises in factory prices, but the garagemen here deny any allegations of profiteering. Fancy having to pay $1,575 for a Ford!

There has been a big gain in popularity of late with the Dodge and Hudson for city use. Ford, Hupmobile, Overland, Maxwell and Buick are still the great favorites as country cars. Studebaker is putting up a good fight to regain its popularity enjoyed in 1914, when it was the country car of South Africa. A big advertising campaign is being carried on, the effectiveness of which is proved by the steady gain in sales.

Hupmobile continues to have the first sale as a country car because of the magneto being fitted. Its four-cylinder engine is a good selling point because the farmers think that more cylinders mean more troubles. The coming new, cheap Overland is being advertised, and while the price has not been set it is expected that it will sell around $1,400 in Johannesburg. The Chevrolet agency has recently been placed with a large Johannesburg engineering firm which plans an active campaign to overcome some of the prejudice which has existed against this car in South Africa.

Car Boom Continues in Johannesburg

In Johannesburg the motor boom still continues, and new garages are going up rapidly. These buildings are for the most part substantial brick and stone edifices that are a credit to the city. Garagemen are getting away from the one-story type of building and are using second and third floors for workshops, etc. It seems certain that an amount of depression must set in soon, especially if car consignments get overdue. Also, the gold-mining industry is suffering now because of increased production costs, and thirteen low-grade mines, employing 10,000 white and about 30,000 native workers, are threatening to close down.

And that is just where the unfortunate part comes in, for the whole of the Union of South Africa really relies on its mines for its prosperity. The people forget that gold mines work out in 40 or 50 years, and have made little provision in the way of other industries. If all the gold mines had to close it might be the best possible thing for the country. Black depression would follow, but more stable industries would rise up, as they did in Australia after the finish of some of the alluvial gold fields—practically on the ashes of the old prosperity.

The importance of South Africa as a country of the future cannot be overlooked. Americans who come here are surprised that so little has been done with the natural resources of the country. They tell us that vast tracts of it compare with the best ranching areas in the United States. At present, with the exception of a healthily increasing farming and mining industry, the country is purely commercial.

The time is ripe now for South Africa to start right in and do something with her mountains of iron ore and other base metals, for she can't get supplies from oversea. A steel works has been started lately, and is turning out passable steel that is getting better as time goes on.

Railroads Need Development

Lately the railroad question has been to the fore in America. It is the same here on a smaller scale. The country is well covered with a network of lines, but there is practically no double track, and the loop system is responsible for hundreds of delayed freight trains. Farmers inland who want to send their produce to the coast have difficulty in getting it trucked, and then perishables often rot on the way by reason of delays. Motor traction over hundreds of miles of the present roads is impossible. The government, which owns practically all the railways, cannot be made to see that it is necessary to give better service, even though at a loss to themselves, in order to develop the country and stimulate activity in the agricultural districts.

The gasoline situation is considerably easier, but the price remains about $1.20 per gallon. Consequently, experimenters are running their cars on all kinds of substitutes, from paraffin to producer gas (charcoal), with more or less success. It is not likely South Africa will come to coal gas, as has London; still, the price of gasoline is a very serious question for the automobile trade.

Electric vehicles are still gaining in popularity for city work, mostly in Johannesburg and Cape Town. The General Garage is fitting pneumatic tires to all its vehicles of 750 lb. and under, as it is found that the radius and speed are increased enormously by their use.

The general use of trailers with large motor trucks is increasing, and local firms are making some fine trailers. Together with general body work, this is the start of the first of the industries connected with motoring.

High Transportation Efficiency Object of Essex Car

Directors of Essex Motors All Hudson Officers—Distinctive Lightweight Four Will Be Marketed Through Hudson Dealer Organization

THE organization of the Essex Motors, announced in AUTOMOTIVE INDUSTRIES last fall, was followed with more than usual interest because its directors are also officers of the Hudson Motor Car Co. At that time it was stated that the new concern would have its product on the market during the summer of 1918.

It has been known for almost two years that a lighter, lower-priced car than the super-six would be furnished Hudson dealers. Although the Essex is being produced by an organization which is altogether separate from the Hudson company, it is being built in the Hudson factory, and will be sold by Hudson distributors and dealers, thus giving it the stamp of an established factory and an established selling organization, based on a design brought out by engineers of Hudson experience.

The fundamentals which governed the design of the Essex are very much the same as those outlined frequently in AUTOMOTIVE INDUSTRIES under "Transportation Efficiency." For the present, a five-passenger touring car alone will be made. In the fall a sedan model will be brought out.

The body design is unusual in appearance, although beyond the more decided use of the beveled edge, which is carried to the front end of the radiator, there is little about it which could be termed radical.

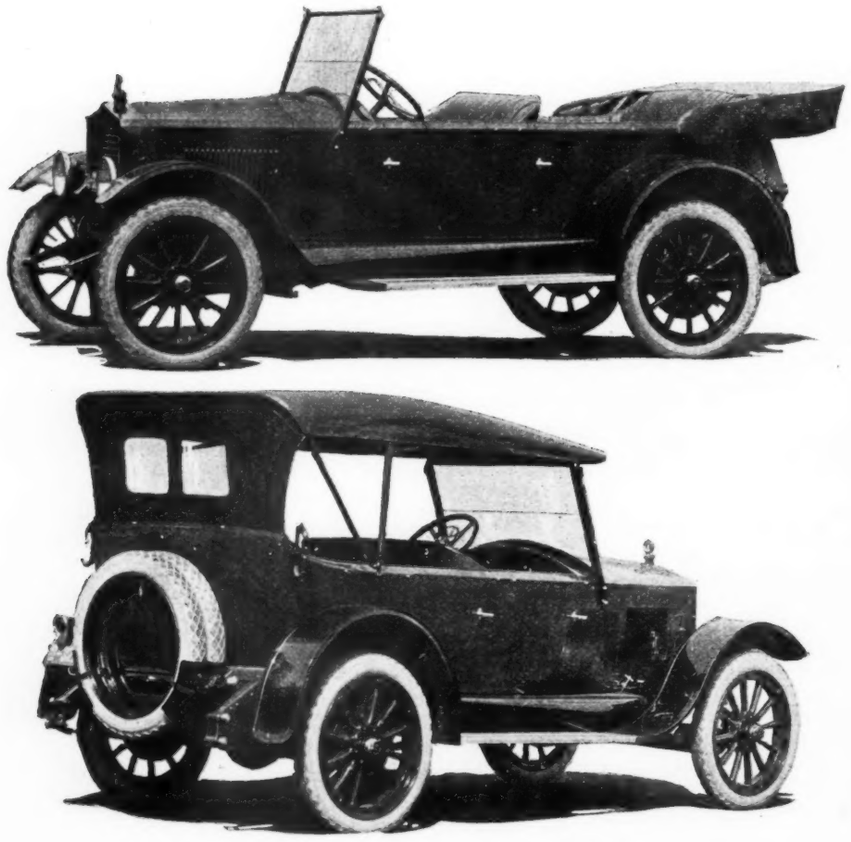
The car sells for $1,395, and incorporates the qualities making for low maintenance and economy. The wheelbase is but 108½ in. in length, although a view of the exterior makes this appear at least 115 in., due to the low-hung body, short hood, long cowl, and general distribution of space.

Probably the most interesting feature of the car is its engine. This is of a lightweight, high-speed type, 3⅜ by 5 in., having four cylinders, and developing more than 55 hp. at 2800 r.p.m. This power, with a total car weight of 2580 lb., including filled tank and two extra tires, gives an unusually high power-weight ratio.

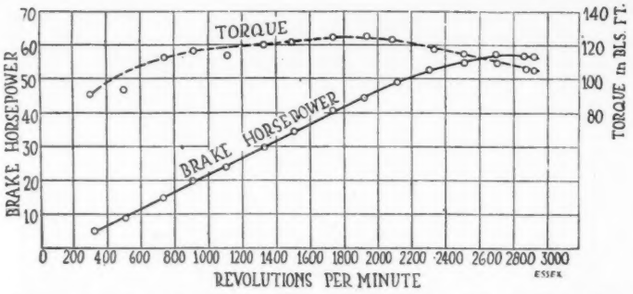
A representative of AUTOMOTIVE INDUSTRIES drove one of these cars over the roads around Detroit, and found the speed to range between 4 m.p.h. and 63 m.p.h. on high gear. The car is exceptionally smooth riding, due to its balance and the use of a 54-in. rear spring one-half the length of the wheelbase. Owing to the use of Lynite aluminum alloy pistons and a fully counterbalanced crankshaft, there is no noticeable vibration at any speed.

The engine is of special interest, being unique in many particulars. It is peculiarly adapted to a car of this short wheelbase because of its short length. Although developing in excess of 55 hp., it is but 29 in. over all, and occupies little of the wheelbase length. The intake valves are in the head and the exhaust valves on the side. The top of the cylinder head is removable, the manifold carrying the carbureter being bolted directly to the head.

The flow of gas from the carbureter is downward into the cylinders, thus distributing the gas evenly among the cylinders and overcoming starting difficulties in winter. Another factor affecting the distribution of the gases is that the cylinder head and manifold passages are internally machined.



The Essex has unusually straight lines, the effect being carried even to the radiator. Seat backs are high to increase comfort



Curve showing characteristics of the Essex 3⅜ by 5 engine

The cylinders are cast in a single block. The engine proper, therefore, is made up of three main castings, the cylinder block, cylinder head, and crankcase, which latter is of aluminum. Below the crankcase there is an oil pan of pressed steel, which can be dropped, and which provides access to the main bearings. In accordance with the latest developments in high-speed engines, the design has been particularly carefully worked out for free intake gas passages. The machining of the ports, which are of large diameter, and the placing of the intake valves in the head, which valves have a clear diameter of 2 1/16 in., insure high volumetric efficiency. The car is so geared that the motor is turning over at 3000 r.p.m. at a car speed of 60 miles per hour. Inasmuch as the car is capable of more than 60 miles per hour, the speed possibilities of this little power plant may be appreciated.

In view of the high rotative speed aimed at, the crankshaft is made of large diameter. There are three bearings; the front one having a diameter of 2 1/16 in. and a length of 2¼ in., the center bearing being 2 3/32 by 2⅛, and the rear bearing 2⅛ by 2⅝ in. The valve drive is taken through helical timing gears, and the intake and exhaust valves are both operated from the same camshaft. The cams are integral with the shaft, which is carried in four nickel-babbitt bearings. The intake valves are operated through rocker arms, while the exhaust valves are actuated through straight push rods.

Thermo-syphon water circulation is employed. The cooling system is to a large degree controlled by the operator through shutters on the radiator. These shutters are hand operated, and in connection with a Boyce motometer permit the driver to maintain the cooling water at the desired temperature. The water enters at the center of the left side of the cylinder water jacket and is carried off slightly to the right of the head, as may be seen from the illustration of the engine. This gives free water circulation around the plugs and valves, through jackets which are of large capacities.

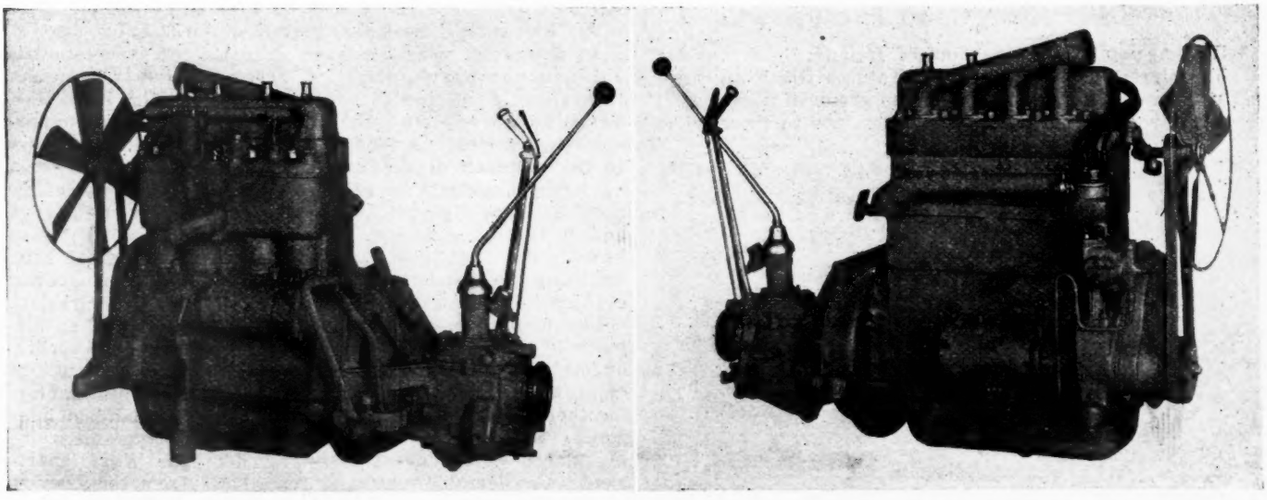
Lubrication is by constant level, circulating splash. The reservoir is in the pressed-steel oil pan, bolted to the base of the crankcase. This pan is so exposed to the air draft resulting from the motion of the car that the oil within it is kept cool. The oil pump is connected with the throttle in such a manner that its length of stroke varies with the throttle opening, thus governing the supply of oil fed to the main bearings. From these bearings the oil overflows into splash troughs in the usual manner and the bearing surfaces are lubricated by the spray from the connecting-rod.

Gasoline is supplied through the Stewart vacuum system. The gasoline tank, located in the rear, has a capacity of 13 gal., and is protected by the frame extension. The tank carries an automatic gage indicating the quantity of fuel in the tank.

The carbureter is made particularly for the Essex car, being a product of the engineers who designed the car, and is of the so-called piston type in which a piston is raised by the suction of the engine and lifts the metering pin which governs the gasoline feed, thus controlling the mixture. For starting there is a strangling device which provides the necessary rich mixture.

Delco electric equipment is employed for lighting, starting and ignition. Lighting and starting is by the two-unit system, with the generator mounted on the right side of the engine, being fastened to the crankcase by means of a strap around the center of the generator housing. The drive is taken off the same gear which operates the Delco timer-distributer unit. The starting motor is mounted on a flange on the left side of the crankcase, engaging with the flywheel by means of a screw gear. The electric-lamp equipment includes parabolic head lamps with dimming attachment, instrument light and tail light, and there is also an electric motor-driven horn located beneath the hood. The electric switches are equipped with security lock and keys. The plugs are in the head, just to the side of the intake valve.

The multiple-disk clutch is contained in an oil-tight case in the center of the flywheel, thus forming in con-



The Essex engine is very compact and, though it measures but 29 in. overall, it develops 55 hp. Intake valves are in the head and exhaust valves at the side

nection with the engine and gearbox a unit powerplant. The clutch has cork inserts giving a soft engagement. The gearbox is a standard three-speed type, fitted with roller bearings throughout and provided with a lock to hold the gears in neutral position. The rear incorporates Hotchkiss drive with semi-elliptic springs shackled at the rear to extensions of the frame unit. The rear axle is a floating type with a reinforced pressed steel housing in which the driving gears and differentials are mounted on a separate carrier bolted to the housing. This carrier, together with the assembled gears, can be removed without taking the axle from the car. The driving gears are helical type. The ratio in the rear axle is 4.75 to 1.

One of the unusual features of the car is the size of the brakes. The brake bands are 14 in. in diameter and 1¾ in. in width. The drums are on the rear wheels, which carry 32 by 4-in. tires. All wheels have twelve spokes. The spring suspension covers an unusual proportion of the wheelbase, the front spring being 36 in. in length and the rear 54 in. Both sets of springs are 2 in. wide. This gives a total of 90 in. of spring length with a wheelbase of 108½ in., or 83 per cent of the wheelbase length. The frame is also unusual in its dimensions and construction. It is a channel-beam type 6 in. in depth at the point of greatest stress. The powerplant is bolted to the frame at the rear direct to a cross member. The frame is strengthened both at the front and rear by tubular cross members.

Owing to the use of a short engine and a unit powerplant and the fact that the engine is placed close up to the radiator, it has been possible to put an unusually roomy five-passenger body on this car. The driver's compartment can be entered or left without difficulty and the operating levers are within easy reach. The body is distinctive in appearance owing to the beveled edge running from the front end to the rear. This gives a noticeably straight effect. The radiator is distinctive also in shape, having a straight angle on top instead of a curve, and the slanting windshield set well back on the cowl presents an attractive appearance. The seats have high backs, reaching the passenger's shoulders on an average-height man. Cushions are deep and set low, so that at no time are the knees of the driver above the edge of the car. The top is fastened to the top of the windshield by means of large thumb nuts. The car is sold complete with the usual tools, wrench, oil can, jack and hand pump equipment.

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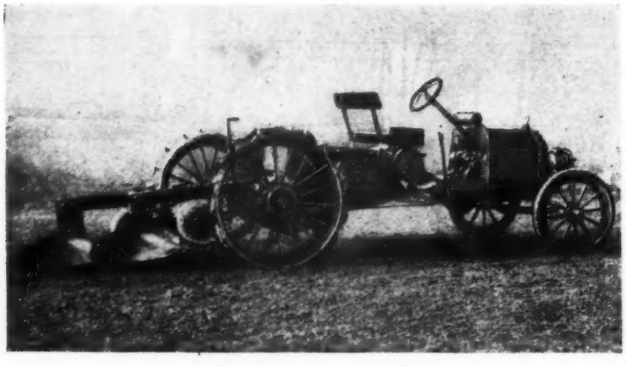
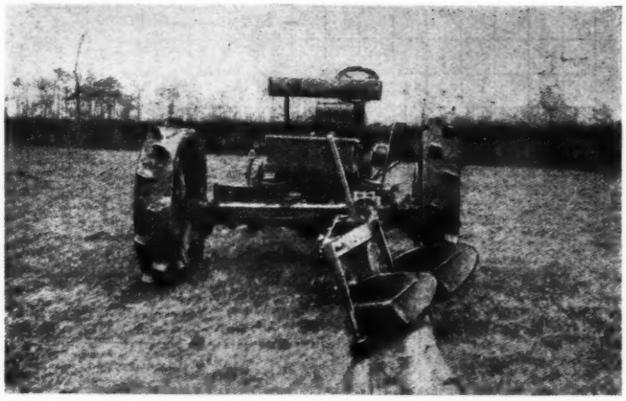
The Ferguson Plow

THE Ferguson plow, a product of Ireland, is of considerable interest as having several features which are novel and unique. It belongs neither to the group of plows which are entirely separated from the tractor, nor to those which



Side view of the Ferguson plow



Rear view of the Ferguson plow

are really a part of the tractor itself, but may be regarded as a combination of the two types. All control of the plow is centered in the control lever which is located alongside the driver's seat, thus making the outfit a one man proposition. This control lever serves not only for raising the plow out of the ground at the headlands, but also to control the depth of plowing. In marking out the headlands, by manipulating the lever, one furrow can be cut right out, and the headlands cut with one furrow only. In laying out the field, the rocking lever can be so moved that the inside furrow is plowed shallow and the outside one deep. Thus a ridge can be thrown up as perfectly as with horses. As the control lever controls the depth, there is no necessity for stopping the tractor to alter the depth of cut. The large disk coulters prevent the loose sods at the ends of the furrows from choking up the plow, and at corners it can be reversed right back to the ditch.

When plowing in stony ground, if the share strikes a flat stone, the back of the plow is free to rise and ride over it. When the share gets underneath a big stone which is too heavy to raise, there is a safety pin to prevent breakage. Six extra pins are fitted in a strong clip on the implement.

The greatest consideration has been given to ease of adjustment and repair, and only adjustments which are absolutely essential are left on the plow. One small spanner wrench fits every nut on the plow where adjustment is necessary. The manufacturer is Harry Ferguson, Ltd., Belfast, Ireland.

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Book Review

Aircraft Mechanic's Hand Book, by Fred H. Colvin, published by McGraw-Hill Book Co., Inc., New York. Price, $3.

In connection with the large scale aircraft program laid out by our military authorities, there are going to be needed thousands of mechanics of various kinds for inspecting, adjusting and repairing the machines. As there was no aircraft industry of any consequence in this country previous to the outbreak of the war, it will be necessary to train mechanics especially for this line of work. While most of the required knowledge will be imparted to the men in the shop and on the flying field by actually showing them what they have to do, a study of suitable books will be a great help. Realizing the demand for such a book, Fred H. Colvin, editor of American Machinist, has written the work under review.

It explains the functions of the different parts of an airplane in considerable detail, by the use of language readily understood by the average mechanic. There are descriptions of all the chief types of engines now in use in this country, together with instructions regarding their care and maintenance. Specifications are given of the several types of training planes which have been approved by the War Department. Considerable matter is reproduced from the Manual of the Royal Flying Corps and from various official publications of our own War Department. There are chapters on instruments for airplanes and on the Lewis machine gun.

Resistance to Rolling of Tractor Wheels in Soft Ground

Preliminary Report of a Research Conducted to Determine the Relation Between Rolling Resistance, Specific Load, Wheel Diameter, Speed and Other Factors *

By Amos F. Moyer

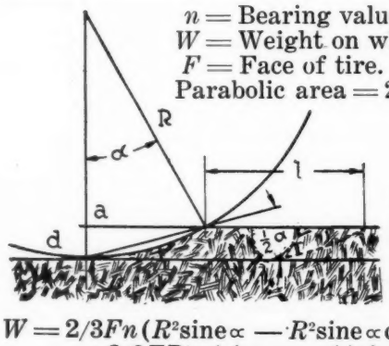
PHYSICISTS define a plastic body as one which can be molded under pressure, recognizing that the rate at which deformation is produced often affects very materially the plasticity of the substance. Funk & Wagnalls New Standard Dictionary states that the body must permit "molding of form," which might lead to the assumption that the volume is to remain unaltered.

The freshly tilled, sandy black loam soil used for the experiments described in this report is not only capable of molding in form, but is to a slight degree compressible as well. The yielding properties of the soil, however, appear to be due to lateral movement under vertical pressure to a much greater extent than to compressing any given amount into smaller volume.

The mathematical derivations which it was desired to verify by these experiments are based on the assumption that soft soil and probably other plastic materials, bear up a unit pressure proportionate to the depth of depression. This is equivalent to saying that the total weight borne up is proportionate to the volume perpendicularly inclosed by the displacing surface in actual contact with the substance and below the surface from which the substance was displaced. In the case of a hard cylindrical body rolling on a level plastic surface this volume consists of the prismatic half segment of the cylinder below the level surface and on the forward side, as in Fig. 1. If the deforming body, instead of being a cylinder, were rounded upward in front and continued flat for some distance backward, so as to rest in contact with the bottom of the track like a sled runner or caterpillar tread, the supporting volume of displacement would include also the rectangular prism extending backward a distance equal to the flat supporting surface. This illustrates the much greater carrying capacity which characterizes surfaces of this kind.

Throughout the detailed studies and experiments thus far conducted, attention has been confined to plain flat-tired wheels of varying weight, width and diameter. Of the mathematical expressions on Fig. 1, equation (1) expresses approximately the law already outlined for a cylindrical body or plain flat-tired wheel, where n is the load supported by the soil per unit volume displaced. From this is readily deduced equation (2), which expresses a similar law in terms

*This research has been carried on with financial aid from the University of Minnesota Research Fund and from the S. A. E.—Editor.



n = Bearing value lbs./cu. in.
W = Weight on wheel.
F = Face of tire.
Parabolic area = 2/3 $a.d.$

$W = 2/3\ a.d.F.n.$ (1)
$a = R\sin\alpha$
$d = R - R\cos\alpha$

$$W = 2/3Fn(R^2\sin\alpha - R^2\sin\alpha\cos\alpha)$$
$$= 2/3FR^2n(\sin\alpha - \tfrac{1}{2}\sin 2\alpha)$$
$$\frac{W}{2/3FR^2n} = \sin\alpha - \tfrac{1}{2}\sin 2\alpha \qquad (2)$$

Fig. 1

$$\text{Mean unit pressure} = \frac{W}{FR\sin\alpha}$$
$$= 2/3 \text{ maximum unit pressure.}$$
$$\therefore \text{Max. unit pressure} = 3/2\ \frac{W}{FR\sin\alpha}$$

Which varies as depth from zero at the surface.

$$\therefore \text{Work per unit area} = d \times \tfrac{1}{2} \times 3/2\ \frac{W}{FR\sin\alpha}$$

Work of depression over distance 1 with resistance P is $\frac{3}{4}\ \frac{W}{FR\sin\alpha}\ dF1 = P1.$

$$\therefore \frac{P}{W} = \tfrac{3}{4}\ \frac{d}{FR\sin\alpha} = \tfrac{3}{4} \text{ slope of chord}$$
$$= \tfrac{3}{4}\tan\tfrac{1}{2}\alpha$$
$$\text{or } G = \frac{P}{W} = \tfrac{3}{4}\tan\tfrac{1}{2}\alpha \qquad (3)$$

Fig. 2

From equation (2)

$$\frac{W}{\pi R^2 F} = 2/3\pi(\sin\alpha - \tfrac{1}{2}\sin 2\alpha)n$$
$$\frac{W}{Q} = s \propto f(a)$$

Where a = cu. ft. cylindrical volume
From equation (3)

$$\frac{P}{W} = G = f'(a)$$

Therefore when n is constant G has a fixed relation to S.
The exact solution of these equations gives:

$$S = \frac{281{,}440G^3n}{(16G^2+9)^2} \text{ or } n = \frac{S(16G^2+9)^2}{281{,}440G^3} \qquad (4)$$

Fig. 3

of the wheel dimensions and the arc α which is in contact with the soil.

According to the principle of the conservation of energy, it must be true that the work done in rolling a wheel a given distance is equal to that expended in depressing the soil over the same distance. This fact expressed mathematically on Fig. 2 results in equation (3). Here P represents resistance or pull required to roll the wheel, and this divided by the weight on the wheel is G, or Equivalent Grade. This is the percentage grade up which the wheel would have to roll without friction on a hard surface to give the same horizontal resistance P. Notice here that the value ¾ tan ½ α, or three-fourths of the slope of the chord subtending the arc of contact, is a considerably smaller quantity than some of the catalogs of caterpillar tractors would have us believe for the loss in rolling a round wheel. One such catalog gives 41½ per cent equivalent grade for a 6-ft. wheel sunk 3 in. in the soil, whereas the law just derived gives 15.6 per cent.

Referring again to equation (2) Fig. 1, it is evident that the factors in the denominator other than n are proportionate to the cylindrical volume of the wheel, which we may call Q. Throughout the calculations this has been expressed in cubic feet, so that W/Q, which is designated as S or specific load, is written in pounds weight per cubic foot of wheel volume. Fig. 3 gives the mathematical proof that there is a fixed relation between S and G whenever n remains constant. For the expression of the exact relation between these quantities indicated in equation (4) I am indebted to Profs. W. E. Brooke and C. F. Shoop, each of whom made an independent

It can be shown that

$$\text{Cos}\alpha = \sqrt{\frac{2P}{FR^2n}} - 1$$

$$d = R - R\cos\alpha$$

$$d = \sqrt{\frac{2P}{Fn}} \qquad (5)$$

$$P = \tfrac{1}{2}d^2Fn \qquad (6)$$

Or resistance depends upon depth of depression, face of tire and soil factor, irrespective of diameter and weight.

Knowing the soil flow and bearing value, P could be determined from the track alone.

Fig. 4

solution eliminating α from equations (2) and (3). Experimentally it has been easy to determine S and G, so that equation (4) has been very useful in studying the values of n.

On slide 4 is given another interesting deduction resulting in equation (5) expressing depth of depression and (6) expressing resistance. Such a simple expression as (6) seems almost uncanny when we realize that if we know enough about the soil, i.e., if we know n, we can tell the resistance of a wheel even if we never saw anything but the track.

Apparatus

Desiring, if possible, to verify some of these deductions, it seemed necessary to provide a course where conditions could be as quickly and as nearly duplicated as possible, in order to obtain a large number of comparable readings. The only condition possible of quick duplication seemed to be freshly tilled soil, making possible the repeated use of one and the same bed. This condition at once suggested the use of a stationary dynamometer which would measure the pull required to move loaded wheels by means of ropes. Knowing the value of averages for such readings, the recording dynamometer illustrated in Fig. 5 was designed and constructed.

Here the rope r is shown leading in from the left horizontally as in pulling a wheel. The sheave A is mounted on the vertical strut B which in turn is pivoted opposite the lower sheave C in such a position that when C is driven at

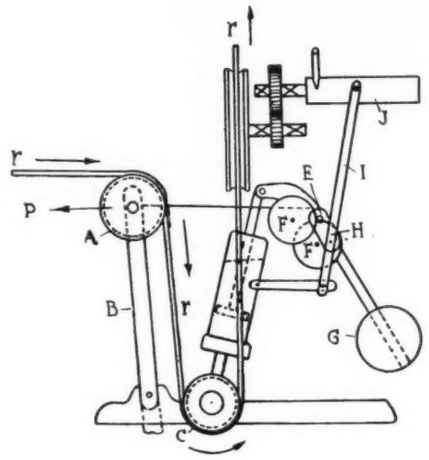
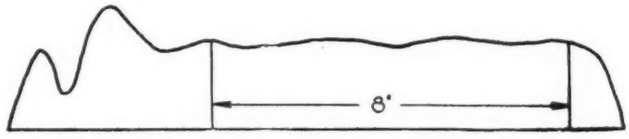


Fig. 5

the required speed, the rope in passing downward is parallel to strut B. This portion of the rope therefore produces no rocking reaction in strut B, while the horizontal portion exerts a force P which is transmitted to the flexible tension member D. The right hand end of D is wrapped over the top of the shaft E. This shaft terminates at both ends in small diameter trunnions which rest on the periphery of the large rollers F, thus greatly reducing friction. Upon E is mounted the pendulum G, the horizontal displacement of which will be proportionate to the pull P in the rope.

On one extremity of E is mounted the crank arm H to which is pivoted the arm I. The lower extremity of the arm I is attached to a link and constrained to move only in a vertical line, so that pencil J at the upper end of I describes a straight horizontal line after the manner of the Thompson indicator pencil motion. Since crank H is in line with pendulum G, the recording pencil J will move horizontally always in fixed proportion to the pull P. To damp the oscillations of the pendulum a loose-fitting oil dash pot is provided as shown.

The recording paper feed is driven by the ascending rope passing over a large transverse sheave which in turn is geared to the recording drum so that ½ in. on the record represents 1 ft. movement of the rope. Two interchangeable pendulum weights, one of lead and one of cast iron, have been employed, giving record scales of 80 lb. and 40 lb. per inch, respectively. With the lead weight, the dynamometer will record pulls up to 250 lb. Fig. 6 shows a typical record and the manner of computation. The peak wave at the left hand end is caused by the inertia effect at starting the wheel.



2 Wheels 24¼" x 6¼", weight 252 lb.
Speed 250 ft. per min.
Scale of record, 40 lb. pull = 1 in.

$$\text{Area} = 11.87 \text{ sq. in., Pull} = \frac{40 \times 11.87}{8} = 59.35 \text{ lb.}$$

Fig. 6

A portion of the record is selected representing average conditions and the area determined by planimeter over a measured length, thus establishing average pull.

The soil bed employed was at first 3½ ft. wide—later widened to 5 ft.—and 8 in. deep, of sandy black loam with only sufficient moisture to avoid dust and "ball" slightly when compressed in the hand. A pair of wheels were mounted rigidly on a shaft, with two ropes leading to the dynamom-

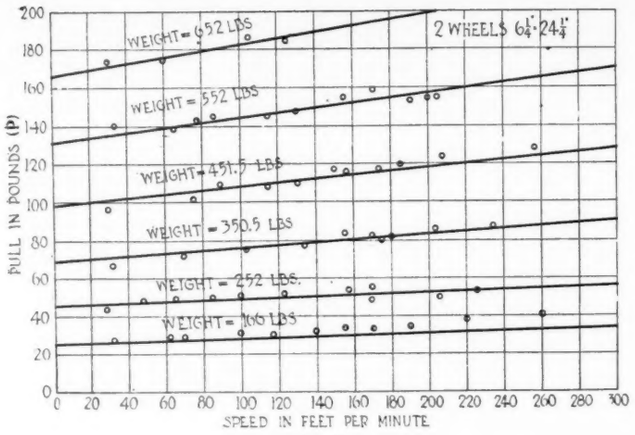

2 WHEELS 6¼"-24¼"
WEIGHT = 652 LBS
WEIGHT = 552 LBS
WEIGHT = 451.5 LBS
WEIGHT = 350.5 LBS
WEIGHT = 252 LBS.
WEIGHT = 166 LBS
PULL IN POUNDS (P)
SPEED IN FEET PER MINUTE

Fig. 7

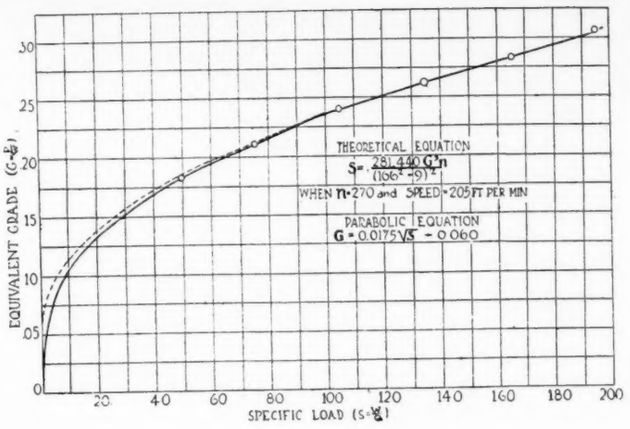


Fig. 8

eter. These ropes were permitted to unwind from the shaft as the wheels advanced, thus eliminating bearing friction. Wheels were easily interchanged, and increments of load were obtained by fastening weights to the wheels in any balanced position.

In accordance with the deductions on Fig. 3, regarding G and S, which we suspected before those derivations were proved, we early began seeking for the relation between these two quantities. While the studies have not yet resulted in mathematical expressions for all variables, we believe that the time devoted to them has been of great profit. On first thought it was not anticipated that the factor n would be anything but constant for a given soil condition, so that S and G of equation (4) would always plot as a single line.

For a considerable number of the earlier tests these quantities did fall quite close to the same line, but with some variations which we were unable to account for. This was at slow speed, in the vicinity of 20 ft. per min., with the heaviest wheels moving somewhat slower. It was the heavy cases not checking with the balance of the readings, which led to the conclusion that velocity was the disturbing factor.

Before this conclusion was reached, however, some interesting studies were made on the law of three-quarters slope with relation to G as expressed in equation (3) Fig. 2, and also on values of n determined from actual displacement.

Two wheels of 33¾ in. diameter and 4⅝ in. face set 13½ in. between tires were drawn through the freshly spaded and leveled soil bed at about 20 ft. per minute for light loads, but diminishing in velocity for heavy loads. An attempt was at first made to determine the depression by scaling the track after the wheels had passed over. By this method only a fair check of the law of ¾ slope was obtained, but values of n calculated from displacement varied as much as 300 per cent. It became evident that the track was not the true level to which the wheel sank in passing over the soil. Next a series of 20 swinging stops was arranged above the course so that as the wheels passed beneath, each stop would be pushed up to a certain position and left at a point marking the top of the tire of the moving wheel. In this way it was proved that the bottom of the track is higher than the lowest point of the tire. The amount of this difference was measured as carefully as possible, taking into account several allowances for inaccuracies of hastily constructed apparatus, and from this data the gratifying check on the law of ¾ slope expressed in equation (3) was obtained ranging from 0.726 to 0.777 for the value of three-fourths in the formula. Values of n in lb. per cu. in. displaced also became much more nearly constant, ranging from 4.28 to 6.27. Subsequently it became evident that this variation was probably caused by diminished velocity at the heavier loads.

Variable Velocity

Fig. 7 illustrates the amount of labor involved in making a comprehensive study of the effect of velocity on the resistance of a single size of wheel. For each point of observation marked on the plate it was necessary to spade up by hand the entire course 3½ feet by 25 feet. Considerable credit should be given to the student assistants who worked long hours at low pay because of interest taken in the problem. This plate represents the resistances obtained for a pair of wheels 24¼ in. in diameter by 6¼ in. face pulled at varying velocities with six increments of load. The lines show clearly that resistance increases with velocity for each weight on the wheels, and that this increase is somewhat more rapid with heavy loads than with light loads. These lines produced were all found to intersect at the left in a common point representing zero resistance and 1013 feet per minute negative velocity or —159.4 r.p.m. The full meaning of this is difficult to comprehend, but the fact is nevertheless of value to us in making deductions.

By reading off the intersections on any ordinate representing a desired speed, a series of values for P will be determined that are of greater accuracy than readings taken at precisely that speed, since the variation of points from the line indicates the considerable error in a large proportion of the individual readings. Please note, however, that the lower line does not coincide with the points of observation.

From the theoretical equation (4) giving n in terms of S and G, and values determined from intersections, it was ascertained that the value of n remained virtually constant for each speed, but varied for different speeds. It was by use of the average value of n obtained from the other lines on this plate that the lower line was dropped below the points of observation, assuming that there had been some undetected error in these readings.

Fig. 8 represents results from the intersection readings at 205 feet per minute or 2 1/3 miles per hour, after the values have been converted to specific load and equivalent grade, S and G. The six points shown correspond to constant values of n, and the curve produced to the origin is obtained by substituting this same value in the theoretical equation. As the general form of this curve, which may be called a characteristic, suggests the parabola, a determination was made

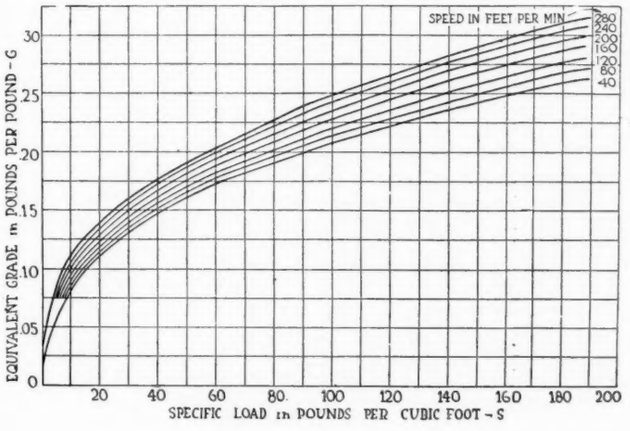


Fig. 9

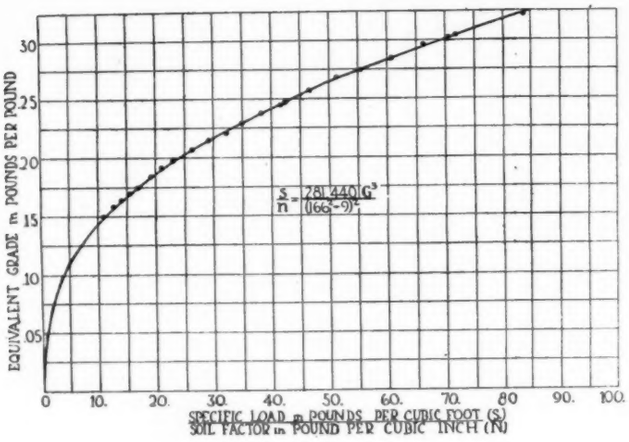


Fig. 10

by trial of the parabola having the analytical form $y^2 = 2\ p\ x + a$ which most nearly corresponds to the actual curve throughout the practical range of values. This parabola is shown by the dotted line which coincides with the full line throughout the right hand part of the field, and probably for some distance beyond. The equation (6) of this parabola as shown on Fig. 8 gives a formula expressing G in terms of two constants and the square root of S. When it is remembered that S is weight per cubic foot of wheel volume, this may be rewritten with a constant over the diameter outside of the radical and weight per inch of tire face under the radical, giving a simple formula for G in terms of weight and wheel dimensions. Unfortunately, however, this formula cannot be universally applied, as will later be shown.

When a series of readings are taken at different ordinates representing increments in velocity, a series of values of n will be obtained, each of which gives a different characteristic curve corresponding to the speed. Fig. 9 shows this series of curves determined from the same data obtained from 24¼ x 6¼-in. wheels. Each of the lines shown represents a certain velocity corresponding to a different value of n. Since n to the first power is the common factor, the variation of which shifts the position of the curve, we may divide through by this and plot G against S/n, when all the curves unite into a single line shown in Fig. 10.

Here are represented seven different velocities and six different weights of forty-two possible values, all of which fall on the same line. In the theoretical equation (7) given on the Fig. it is evident that if the right hand member can be approximately written as an exponential function of G, it will be possible to express G in terms of S/n. To accomplish this the points were transferred to logarithmic plotting paper, giving the straight line shown on Fig. 11. This gives the approximate exponential equation (8) shown. This formula is universally applicable for values of $\frac{S}{n}$ between 10 and 100, provided n is known for the conditions obtained. If S were expressed in lbs. per cu. in. of wheel volume instead of lbs. per cu. ft., the value of the constant 0.06077 would, of course, be altered. Since n, the displacement value of the soil, is already in lbs. per cu. in., the factor in parenthesis $(\frac{S}{n})$ would then become a mere ratio or percentage of specific wheel load to displacement value. For values of S/n between 100 and 300 this has been found to be nearly a straight line on ordinary plotting paper representing the equation $G = 0.00140\ S/n + 0.210$.

The laws concerning the values of n are not yet completely ascertained. As shown in the data from this individual pair of wheels, n varies with velocity. It seemed likely that n becomes zero at very high or infinite velocities. On the other hand, there were indications of zero resistance to rolling at 1013 ft. p. m., which would correspond to infinite values of n. N was therefore plotted on log. paper against velocity plus 1013. Fig. 13 shows this to be another straight line in a position representing the hyperbolic equation (9) given in the Fig.

Varying Diameter

But this expression for n was determined from the same single pair of wheels where one or more lines had been "doctored" to make n uniform for each speed. While a fair check has been obtained from other widths of the same diameter, other diameters show a very consistent variation. A pair of larger diameter, 33¾ x 4⅝ in., not only gave different values of n at corresponding speeds, but at any given speed there was also a consistent increase in n with increments of load. This seemed to indicate that the packing of the soil under a larger diameter of wheel was of such a nature as to cause a continually increasing amount to be borne up per cubic inch displaced with increasing loads. If this was true of a wheel larger than 24¼ in., would the reverse be true of a smaller wheel? Trial with a pair of wheels only 15¼ in. in diameter proved that with increasing loads decreasing values of n were obtained at any speed.

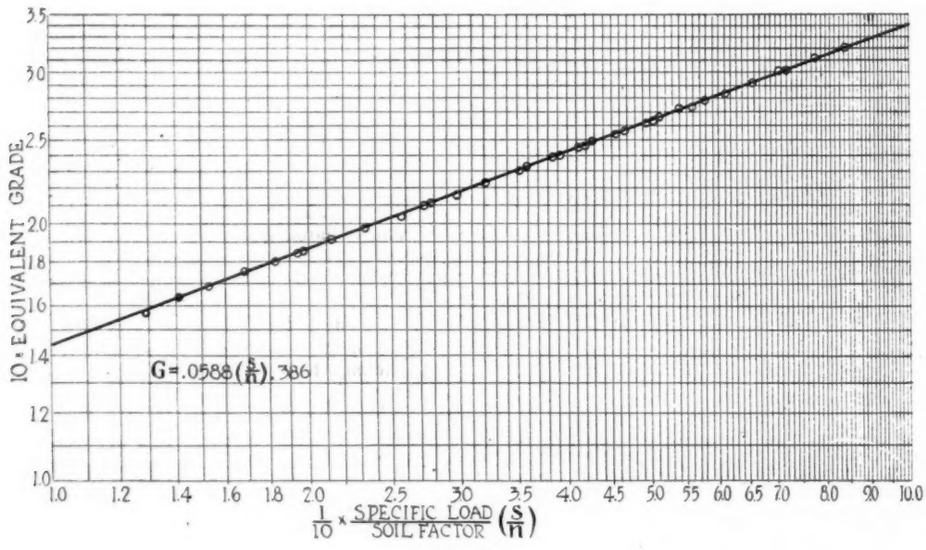


Fig. 11

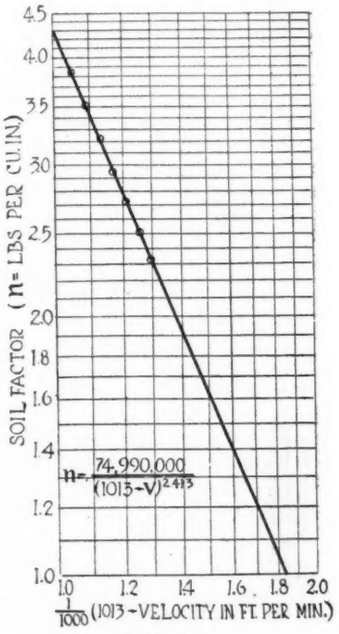


Fig. 12

This indicated another law as affecting the value of n, as it appeared that only one diameter would give a constant n for each speed.

In view of one or more lines in Fig. 7 not coinciding well with the points obtained in the tests on the 24¼-in. wheels, it was found, after making corrections, that there was also a variation here in one respect similar to both of the other diameters. In place of lines representing constant n being true ordinates as assumed in Fig. 7, these were found to be curved and concave to the left, being tangent to the vertical at about half their height.

The 15¼-in. wheels gave lines of constant n concave to the left but sloping backward, while the 33¾-in. wheels gave similarly concave lines, but sloping forward. Apparently larger diameters will give these lines more nearly flat, but curved in the same direction. The nature of the curves obtained are such as to render a mathematical representation very difficult. Each line of constant n for large wheels is relatively flat at the left and curves upward more rapidly at the right. With all wheels of larger size than about 24 in. increments in diameter have not only the effect of increasing the volume of the wheel and reducing S but also of increasing the value of n, so that S/n is materially reduced, and hence also the value of G as expressed in equation (8). This argument then favors large diameter for load carrying wheels. With general reference to the variation in resistance with change in velocity, it is encouraging to note that there is coherence between wheels of different diameters in the point of intersection of the resistance lines produced, as referred to in Fig. 7. This intersection occurs at zero resistance and 159.4 r.p.m. for all wheels, the value of 1013 ft. per minute applying only to the 24¼-in. diameter. It therefore appears that there remains one important law which it is not yet possible to write mathematically, namely, the variation of n with wheel diameter and depth of tillage. When this can be done it will be possible from the foregoing to express a general formula for wheel resistance involving the ordinary variables convenient for practical use.

After all of these determinations for the value of n are made, it may be asked whether the values actually represent weight borne up per cubic inch of soil displaced, or merely a hypothetical "something" which will satisfy a complicated equation. In obtaining data on the actual displacement of soil, there was no means at hand for ascertaining the "wave" action in front of the advancing wheel, merely the volumes being calculated which were below the original soil surface. Actually this wave action plus the small bank of loose earth which always forms in immediate contact with the tire, effect a greater virtual displacement than would be obtained by the method last described, and hence a smaller value of n. This is also what is obtained by the mathematical determination of n from S and G. Thus we see that the mathematical determination of n automatically takes into account several variables which would be difficult to determine by measurement. When the laws of variation of n are once determined, the values thus established will give true values of resistance, since resistance is the quantity whence they were derived.

In many theoretical solutions of engineering problems, quantities are encountered which make difficult the mathematical expression of exact relations, and short cuts based on experiment are often very expedient. One such shortcut is to plot experimental values.

Using any desired increments in weight per inch of tire face, the total load W and resistance P can be determined, and hence also G, which equals P/W. Up to date we have only three points of observation on these curves and in several instances but two. It seems reasonable to expect, however, that these lines are of a quasi-hyperbolic nature, as we would expect G to diminish with large diameters and to mount upward with absurdly small wheels if the weight per inch of tire face were kept constant. A chart of this kind when completely determined over wide ranges of diameter and load will in many respects be as useful as a theoretically correct formula. Indeed it may be found possible to develop an imperical formula representing approximately this series of lines. At the present time this possibility does not seem as remote as does the mathematical expression of n in terms of diameter and load.

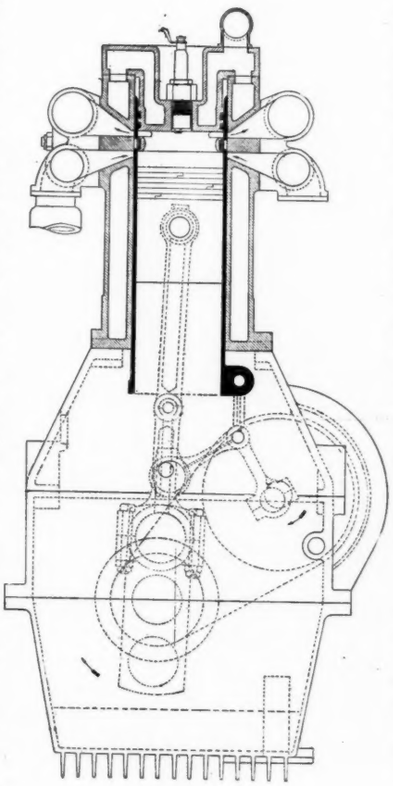
S. S. V. Motor Has Single Sleeve Valve

A NEW sleeve valve engine is being developed by the S. S. V. Motor Co. of Pittsburgh, Pa., the design being due to Charles B. and James M. Gearing. A cross sectional view of the engine is shown herewith.

The engine has four cylinders of 3½ in. bore by 5 in. stroke, and a single sleeve is interposed between each piston and its cylinder wall. The sleeve, of course, reciprocates at one-half the speed of the piston, making one reciprocation during each complete engine cycle. Its travel is equal to 13-16 in. This makes a total travel of 1⅝ in. during a complete cycle, as compared with 20 in. of piston travel. The sleeve is said to have a dwell corresponding to 275 deg., during which period take place the compression and power strokes. The ports in the cylinder wall and in the inner head are so arranged that the port in the sleeve is between the inlet and exhaust ports during this particular period.

When the crankshaft is 45 deg. from the bottom dead center on the power stroke, the sleeve moves up and begins to open the exhaust port. The latter closes at the top dead center. The inlet port is opened by a quick motion of the sleeve valve.

There are two inlet and two exhaust ports to each cylinder. The sleeve is positively operated by a double toggle combination, one link of which is driven by an



eccentric shaft rotating at one-half crankshaft speed and the other half by an eccentric which is placed above the crankshaft and operated by means of the connecting rod so that it has an irregular angular motion. The upper end of the two links is connected by a third link to a lug on the sleeve.

The whole cylinder block is an aluminum casting, without special lining, as all of the wear comes on the inside of the sleeve. An experimental engine that has been built developed a torque of 110 lb. (length of brake arm not given) at 1400 r.p.m. The spark plugs are located centrally in the cylinder heads. This engine will run up to 2700 r.p.m., it has been definitely stated.

The exhaust ports have their top edge on a line with the bottom of the inner head and are 2 7-18 in. wide, measured circumferentially. They afford a very direct passage for the exhaust gases from the cylinder and this is believed to have a tendency to keep the cylinders free from carbon.

Lubrication is by the force feed system, oil being fed under a pressure of 5 to 10 lb. per sq. in. to the three main bearings and through drill holes in the crankshaft to the crankpin bearings. Oil thrown off from the crankpin bearings lubricates all the other internal parts. The sleeve-operating shaft, as will be seen, is chain-driven.

Fuel Feed Line Installations

There Should Be No Loops or Upward Kinks in the Line, Which Would Form Air Pockets and Obstruct the Flow

By O. H. Ensign*

THE proper installation of fuel feed lines on automobiles, trucks and tractors is one well worth giving careful consideration.

It is a most unfortunate fact that, while designers have in a large measure been careful about the location, dimensions, accessibility and correct proportion of parts of the whole structure, they have simply left the carbureter, the most vital, delicate and sensitive part of the machine, to take care of itself and let some mechanic in the shop connect up the tank to the carbureter who is neither trained to think right along hydraulic lines nor has been given proper instructions. At least, this is what it appears to any one familiar with the necessary hydrostatic conditions of the delivery of any liquid in a uniform manner with a limited amount of head.

Upward Bends Harmful

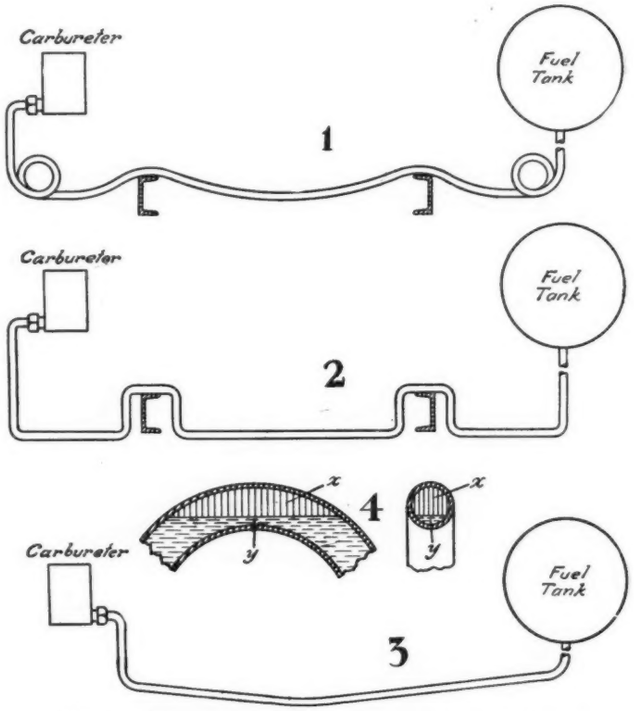
It is a well established hydraulic fact that no dependable flow of any fluid under moderate head can be obtained through a pipe line having upwardly extending bends or syphons in any part of its length; that such bends, with the condition of head prevailing on automotive apparatus, may go so far as to absolutely prevent flow; that the very least trouble they can cause is to limit the flow to a very small fraction of what the pipe would carry if it were installed in such a manner that any gas formed or bubbles of air accumulated could rise either to the tank or to the carbureter.

Fig. 1 represents a type of fuel line installation that has come under the observation of the writer on many trucks and by some of the best manufacturers. Fig. 2 is a form of construction that has frequently come under my observation as installed on automobiles. Both of them are vitally wrong and no dependable fuel level and supply can be obtained at the carbureter unless 5 or 6 lb. to the square inch is carried in the fuel tank.

Enlarged Section Shown

Fig. 4 is an enlarged section of an upwardly extending curve in such a pipe line. The portion indicated by y represents the condition and extent of the fuel in such a pipe line when air has accumulated. The portion represented by x is the location of the air bubble and extent that it may assume. So far as getting fuel through this line with 5 or 6 in. or a foot head, you might just as well consider the area marked x as a wooden plug firmly fixed in position, and the area marked y as the allowable space for fuel flow, and when this occurs four or five and, as I have frequently found it in crooked lines, twenty times between the tank and the carbureter, it is truly a wonder that the carbureter has come off with so little condemnation as it has received.

Fig. 3 represents the proper form of such a line, and it must be followed in exact detail, for one bend extending upwardly in a straight run, equal to the diameter of the line, may cause erratic carbureter action. Any air bubble which may be formed in a line similar to Fig. 3 will flow either to the carbureter or to the tank; in Fig. 1 and Fig. 2 it will remain at the bends until forced out by disconnecting the line at the carbureter and putting a 2-lb. or more pressure on the tank.



Showing incorrect and correct fuel line installations

With the fuel lines as installed in Figs. 1 and 2, invariably the carbureter will have to be set so that it will average too rich in order to compensate for the slow fuel feed under maximum pull occurring under these conditions.

The method of connecting the carbureter on the front side, as shown in Figs. 1 and 2, is also wrong, for, were the rest of the line correct, in mounting a stiff grade you have a chance for an air bubble at the bend close to the carbureter. It should always connect from the rear.

Spirals Not Necessary

The spirals shown in Fig. 1 are not necessary to protect the line. A long enough curve of the same radius, at the same point as shown in Fig. 3, will answer equally well. There are many ways to arrange the fuel lines so as to prevent crystallization from vibration, but if it is insisted that the spirals shown in Fig. 1 be used, they

(*Continued on page* 957)

**Editor's Note.—O. H. Ensign is president of the Ensign Carbureter Co., Los Angeles, and for many years has given much study to carburetion for gasoline and kerosene.*

Nomography*

With Special Reference to Its Use in Engine Design

By F. Leigh Martineau, Assisted by A. Marshall Arter

THE word "nomography" means literally "the art of drawing up laws in proper form." The "laws" of the engineer are expressed as formulæ with different numbers of variables, and the "nomogram" of the engineer is a diagram giving graphically the solution of a formula in such a form that all functions of the variables can be found by reference to the diagram alone without further construction or calculation.

As a general rule nomograms can be easily constructed to give the solution of all formulæ, and they are without doubt a device of great importance to the engineer of to-day, by assisting in the calculations necessary with more rapidity than a slide rule and without the possibility of the introduction of errors which exists in its use. Nomography can be an aid to efficiency in the drawing office and factory.

The particular subject of the paper was first introduced to the public by M. d'Ocagne, Ingénieur en chef des Ponts et Chaussées, Professeur à l'Ecole polytechnique in Paris, in or about the year 1884, and many works on the subject have been produced by him since. The first notice of the subject in England appears to have been an article in the *Magazine of the Royal Artillery Institution* in 1910 from the pen of Captain (now Lieutenant-Colonel) R. K. Hezlet, R.A. "Nomography or the Graphic Representation of Formulæ," by the same author, appeared in 1913.

It is usual to represent two variable formulæ by a graph in cartesian co-ordinates, the abscissæ representing the values of one variable and the ordinates the values of the other. In such a case a definite curve is formed (see Fig. 1) in which the abscissa a and the ordinate b of any point on the curve represent corresponding values of the variables.

In this instance,

$$b = 1/a \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

i.e., b is the reciprocal of a.

*Paper presented to the Institution of Automobile Engineers of Great Britain.

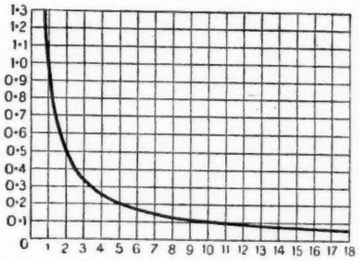


Fig. 1—Graph of numbers and reciprocals

Here the intervening values have to be read by the intersection of the two lines representing abscissa and ordinate, and as a consequence interpolation is difficult. This type of diagram is called by Colonel Hezlet an "intersection" diagram. The corresponding "nomogram" becomes one line with two scales, one reading on each side.

Two different nomograms are given in Fig. 2 to show this, and are both converted from Fig. 1.

In each instance a is the right-hand scale, *i.e.*, the number, and b is the left-hand scale, *i.e.*, the reciprocal. In (I.) the number scale is regular and the reciprocal scale varied to suit it, while in (II.) both scales are logarithmic scales, the one reversed on the other. It will be noticed that in this instance interpolation for intermediate values is quite easy, and, further, that the diagram with the logarithmic scale renders this more simple than the regular scale.

When a graph is made to represent three variables in cartesian co-ordinates, it is necessary that two should be indicated by abscissa and ordinate respectively, and that a series of curves should be drawn representing definite known values of the third variable.

The diagram given in Fig. 3 shows such a graph, in which the ordinates indicate the fuel used in pounds per horsepower per hour by an engine and the abscissæ the thermal efficiency per cent, while a series of curves are drawn representing known values of fuel in British thermal units per pound.

If, as an example, it is desired to find the efficiency of an

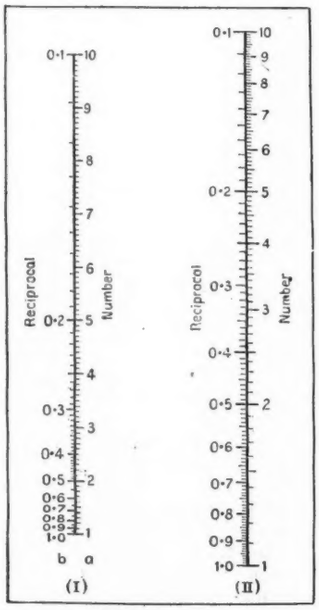


Fig. 2—Scales of numbers and reciprocals

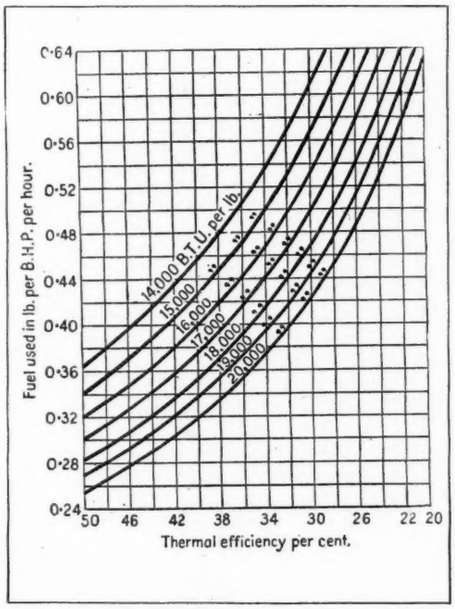


Fig. 3—Thermal efficiency "intersection" diagram

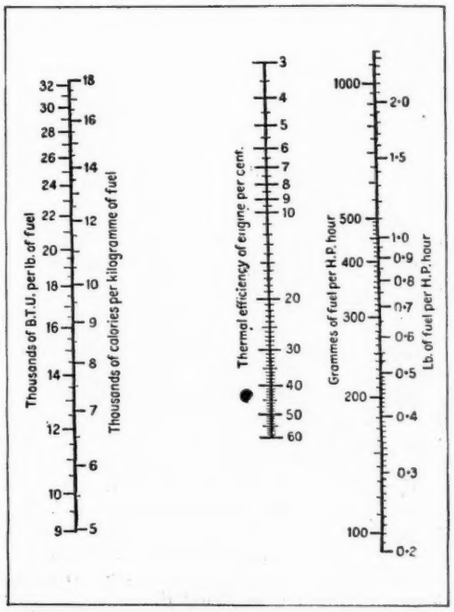

Thousands of B.T.U. per lb. of fuel
Thousands of calories per kilogramme of fuel
Thermal efficiency of engine per cent.
Grammes of fuel per H.P. hour
Lb. of fuel per H.P. hour

Fig. 4—Thermal efficiency "alignment" diagram

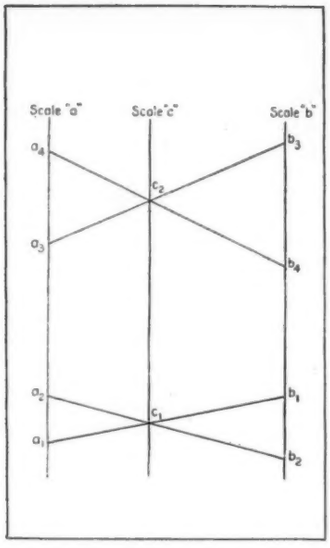


Fig. 5

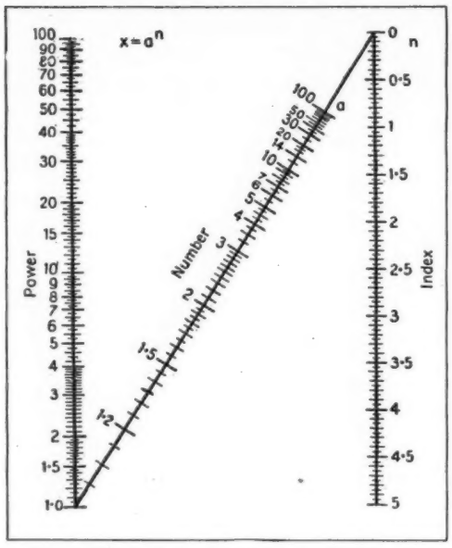


Fig. 6—Powers and roots of numbers

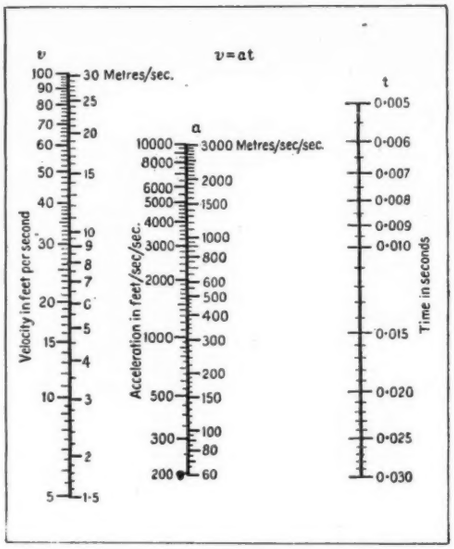


Fig. 7—Velocity, acceleration, and time

engine using fuel of value 17,700 B.t.u.'s per lb. and consuming 0.54 lb. per hp. per hour, then it is necessary to interpolate the value of the fuel and afterward refer to the base line for the efficiency. This operation is extremely difficult in a diagram of this type, and one likely to lead to error. When, however, this "intersection" diagram is changed to a "nomogram" or "alignment" diagram, all these difficulties disappear and the reading is rendered much more accurate.

Fig. 4 shows a nomogram, from which by the simple drawing of one straight line the thermal efficiency of any engine can be at once obtained. The diagram can obviously be used for either indicated or brake efficiency as may be desired.

It will be noticed that it has been possible to make this diagram over a much larger range than the other—so large, in fact, as to make it include almost all usual fuel values and all reasonable consumptions.

A further reference to Fig. 3 will show that, should it be required to read this diagram in metric measurements, it can be arranged with the ordinate scale graduated also in grammes of fuel per horsepower per hour, but the curves drawn across the diagram to represent fuel values will not then read in round numbers for calories per kilogram of fuel, so that the question of interpolation will become still more difficult.

In the nomogram Fig. 4, however, both scales are easily graduated to read in British and metric units; under these conditions it is therefore possible to read either or both and make a comparison between tests carried out under both units of measurement.

It is now advisable to define somewhat the formulæ which can be represented by nomograms and afterward explain the method of procedure.

There are really three general types of nomogram which may be called types A, B and C.

Type A.—This is a nomogram with three parallel rectilinear scales as Fig. 4, which can be constructed whenever the formula can be written:

$$a \pm b \pm c = 0 \quad \ldots\ldots\ldots\ldots\ldots (2)$$

If the formula is already in this form ordinary regular scales can be used, but if it is in the form

$$a \times b = c \quad \ldots\ldots\ldots\ldots\ldots (3)$$

it will be necessary to use logarithmic scales, as, by taking logs., this can be written:

$$\log. a + \log. b - \log. c = 0 \quad \ldots\ldots\ldots (4)$$

Type B.—In this nomogram there are two parallel rectilinear scales and another rectilinear scale inclined to these two.

If the formula is written in the form

$$a \pm bc = 0 \quad \ldots\ldots\ldots\ldots\ldots (5)$$

this type can be constructed.

It will be seen that by taking logs. this type can be generally converted into Type A.

Type C.—In this nomogram there are two parallel rectilinear scales and one curvilinear scale.

This type can be constructed when the formula can be written:

$$ac_1 \pm bc_2 \pm c = 0 \quad \ldots\ldots\ldots\ldots (6)$$

where c_1, c_2, and c are functions of the third variable c.

The plotting of these diagrams is really quite a simple matter after a little practice.

Although the relative positions of the lines and the scales to be used are capable of being calculated, it involves a complete knowledge of the theory on which the diagrams are based, and it is generally unnecessary to go to this trouble.

The method which can be used in most cases may be described briefly as follows:

In the first instance, settle the range it is desired to indicate in each scale, and, after drawing two parallel lines, say some six inches apart, on a piece of paper, mark roughly thereon a few points of the scale suggested. This can be done with the scale of a slide rule as a guide, if a logarithmic scale is to be used, or with an ordinary scale in the case of a regular scale.

Assume values of the first two variables, *i.e.*, those scaled on the two outer lines aforesaid, and obtain a value for the third variable by calculation; with this value and a second value for the first variable obtain a second value of the second variable; to fulfil the conditions of the diagram these values lie on two straight lines, joining points on the two outer parallel lines and crossing at the common value on the central line. One point on the central line and its value is therefore determined. Repeat this process at the other end of the diagram, and the result will be that two points will be fixed giving the position of the central line and its scale; this line can be therefore drawn and the scale added to it.

Reference to Fig. 5 will make this quite clear; in this, the line a is graduated to suit the first variable, and the line b to suit the second variable, these being the two outer scales. With values a_1 and b_1 a value c_1 is determined, then with values a_2 and c_1 the value b_2 is found; these can then be plotted on the scales, and will be represented by two straight lines a_1, c_1, b_1, and a_2, c_1, b_2, which cross at the point c_1.

Further values are then obtained, such as a_3, c_2, b_3, and a_4, c_2, b_4, and these are drawn in as in the diagram.

As a general rule it is necessary to use logarithmic scales. To facilitate the laying out of these, the authors have devised a simple adjunct to the slide rule which enables scales to be quickly and accurately laid off on paper. It consists of two slides to move on the central scale of a slide rule; one of these slides has a celluloid projection on which crossed lines are ruled, one of which is carried across the face of the scale as in an ordinary slide rule cursor, thus enabling the slide to be shifted to define an exact position on the scale. To the other slide is pivoted an arm capable of being rotated around its

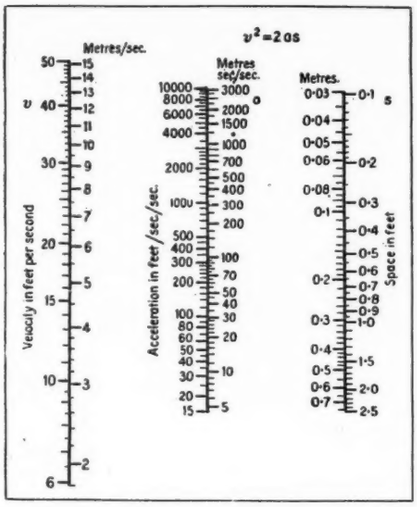


Fig. 8—Velocity, accelerator, and space

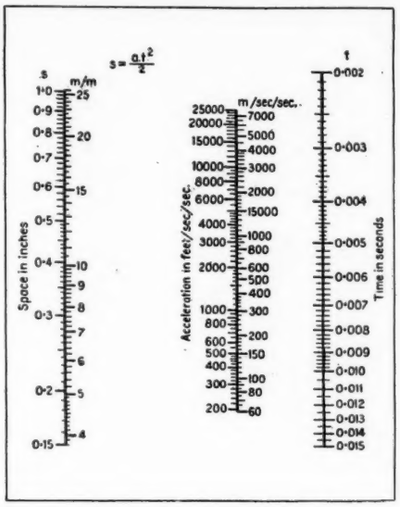


Fig. 9—Acceleration, time, and space

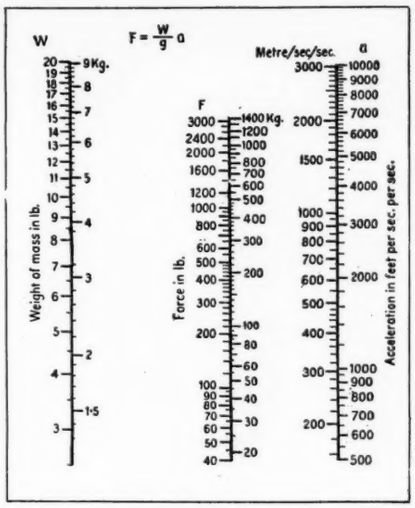


Fig. 10—Force, weight, and acceleration

pivot center; this center is the same distance from the rule as the crossed lines, and its position is indicated by a similar line to read on the scale.

These two points can therefore be placed in any definite relation one to another as may be desired.

The pivot center is made as a milled screw so that the rule edge attached to it can be rotated around this center, and yet always remain as a radial line through it and be fixed in any position as desired.

Through the ends of the scale are two holes in which are tightly fitting needle points, and these, when pushed through firmly, fix the scale in position on the drawing board.

The method of use is as follows:

Having fixed two positions of known value on a straight line, the slides are shifted on the scale to corresponding positions. One slide is then placed in position on the drawing with its crossed lines on one of the points on the line to be graduated, and the scale placed at an angle to the line. The two needle points are then pushed through into the board to fix the position of the scale. The rule edge is then rotated around the center until it crosses the line on the board at the other point marked; after it has been locked in position the whole line can be quickly graduated by shifting the slide to each graduation on the scale it is desired to place on the line.

Generally it has been found desirable to make a rough diagram to ascertain that all the proportions are correct and that the scales read in the right direction, and afterward make a finished one from the data thus determined.

As examples of the uses to which these diagrams can be put, the following may be interesting.

The relation between the roots and powers of numbers is represented in Fig. 6.

The formula in this case is

$$x = a^n \quad \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

or, taking logs.,

$$\log. x - n \log. a = 0 \quad \ldots\ldots\ldots\ldots\ldots (8)$$

This is Type B nomogram.

It will be noticed that, by means of this diagram, powers and roots with fractional indices can be dealt with as easily as those with ordinary whole number indices.

In this figure a straight line joining the index on the right-hand scale, across the number scale in the center, gives the power of the number on the left-hand scale. Obviously if the root of a number is desired, the line will join the number in the left-hand scale to the index in the right-hand, and will cross the center scale at the required root.

Incidentally it will be noticed that this diagram shows that any number to the power of zero is one, as the only straight line crossing all numerical values joins the zero index to one on the power line.

Among the ordinary fundamental formulæ in general use is the formula

$$v = at \quad \ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Taking logs., this becomes

$$\log. v - \log. a - \log. t = 0 \quad \ldots\ldots\ldots (10)$$

This is a nomogram of Type A and has been plotted in Fig. 7.

It will be noted that in this case also both British and metric units have been employed, and direct comparisons or conversions are therefore possible.

A further fundamental formula is

$$v^2 = 2\ as \quad \ldots\ldots\ldots\ldots\ldots (11)$$

Taking logarithms, this becomes

$$2 \log. v - \log. 2 - \log. a - \log. s = 0 \ldots. (12)$$

or a Type A nomogram. This has been plotted in Fig. 8.

Among the fundamental formulæ is also to be found:

$$s = at^2/2 \quad \ldots\ldots\ldots\ldots\ldots (13)$$

This expressed as logarithms with s in inches becomes

$$\log. s - \log. 6 - \log. a - 2 \log. t = 0 \ldots\ldots\ldots (14)$$

This is plotted in Fig. 9.

This will be found useful for determining the average acceleration produced by valve cams with constant acceleration.

(*To be continued*)

Fuel Feed Line Installations

(*Continued from page* 954)

can be placed with a vertical axis and will serve their purpose as well as or better than the horizontal axis.

While on this subject, another frequent cause of erratic carbureter action, resulting in low economy and loss of time and other causes of expense, is the lack of a sufficiently large strainer and trap. It is almost impossible to incorporate within the carbureter a large enough trap and strainer.

There certainly is an enormous amount of fuel sold today of all grades which carries more or less foreign matter and water, and the small strainer that it is practical to put into the carbureter as a last prevention against fouling of the float valve or fuel orifice should not be depended upon to take this foreign matter out. There should be a very much larger screen at a very low velocity connected with a trap, and it is the writer's opinion that such a trap should hold at least half a pint.

The time lost in a very few number of days in certain seasons of the year, from water in the fuel, will pay over and over again for the expense of such a trap. Especially in tractor work is it important, as the cheaper grades of fuel, with less care in refining, are often used, and, again, the dust accumulating around the tractor is so frequently accidentally brushed into the tank. There should be ample space to collect all débris from every source, as well as water.

Detroit Has Complete Ground and Flying School

National Training Corp. Course Includes Theory, Shop Work and Practice on Own Field—Students Qualify Under A. A. C. Rules

THE National Training Corp., with a ground school in Detroit and a flying field near Grosse Pointe, 15 miles distant, is offering a complete course of instruction in flying, including class work in air dynamics, which leads to the award of a pilot's degree if the student is qualified.

The ground course averages 8 weeks. First the students are given a week of theory, after which they spend a week in the cabinet shop, 3 days in the fabric shop, 2½ weeks in the erecting shop, 3 or 4 days in the copper and blacksmith shop, 2½ weeks in the motor shop, and a week studying carbureters and magnetos. By this time the average student has a thorough knowledge of airplanes and is ready to begin making flights.

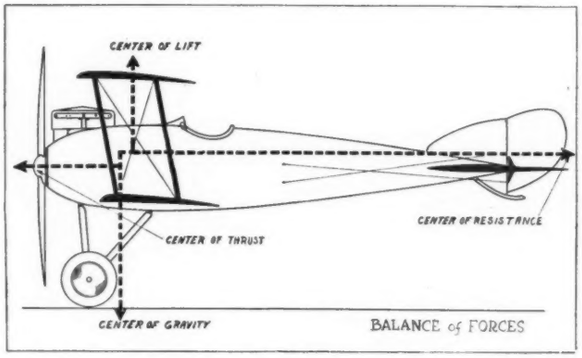
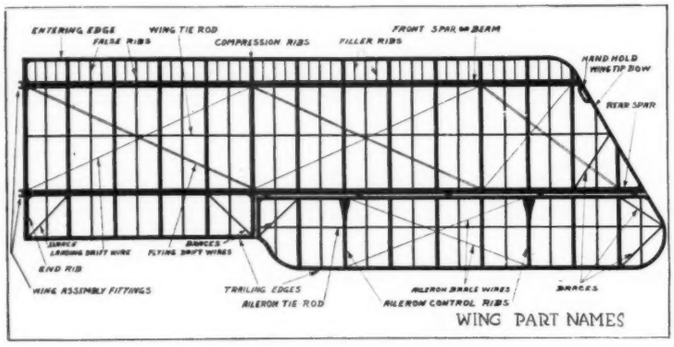


Diagram showing balance of forces on airplane



Instruction chart giving names of wing parts

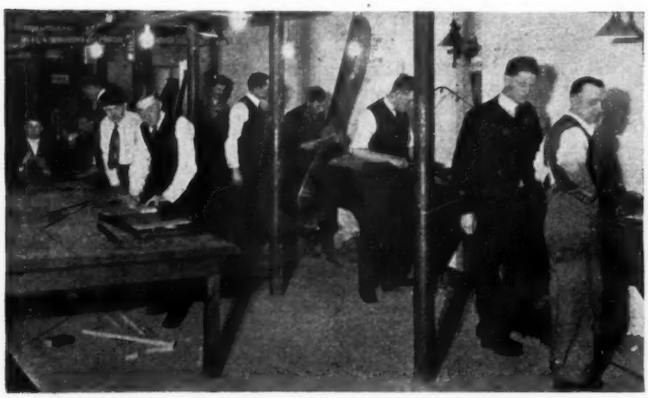
Next comes the flying course. The time over which this is spread depends entirely on the individual, but the actual flying time amounts to 15 hr. with the average man. This is cut up into periods of 15 to 20 min. At the end of this time the student should be quite proficient in handling the plane and gains further experience in 20 to 25 hr. solo flying. He is then ready for the American Air Club tests. If he passes these he is given a license as air pilot.

During the course the students receive instruction in wireless telegraphy and map sketching and reading.

In the ground school the students make all the parts except the engine by hand. This familiarizes them with all parts of the machine and with their uses.

V. C. Babcock, who was senior aviator in the U. S. service, has prepared the entire course in the form of pamphlets and blue prints, each one covering a specific subject. He is assisted by W. W. Herne, formerly of the Royal Flying Corps. The method of teaching is a combination of the American and French methods.

The school is now erecting a hangar on its flying field 15 miles from Detroit that will accommodate four machines. The tract of land is 1½ miles long and 500 ft. wide and is very level. This is only the first unit. It is planned to build barracks and run them on military lines. No profit is expected from this source.



Men getting shop practice

Class instruction in aerodynamics

Whitney Tractor a Two-Plow Machine

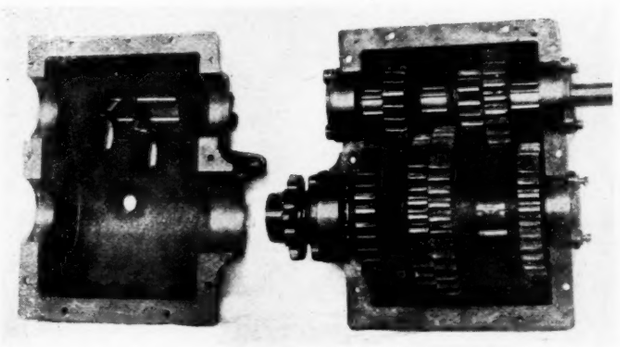
Equipped with Low-Speed Double-Opposed Engine and Three-Speed Sliding-Gear Transmission—Belt Pulley on Engine Shaft

A TWO-PLOW tractor with a three-speed gearset is manufactured by the Ohio Mfg. Co., Upper Sandusky, Ohio. It is designed to haul two 14-in. bottoms under all conditions of soil and weighs complete with angle lugs 3000 lb. Of this weight 1000 lb. rest on the front wheels and 2000 lb. on the rear wheels. The engine is a two-cylinder opposed Gile, having a bore of 5½ in. and a stroke of 6½ in. It is set with its crank transversely to the tractor frame, and the transmission to the rear axle is entirely by spur gears and chain. The engine is of the L-head type and is fitted with a drop forged crankshaft which is doubly heat treated. A governor is fitted to the engine.

Gasoline is the fuel used, and a supply of 9 gal. is carried in a tank located in front of the radiator. This location was undoubtedly selected with a view to facilitating replenishment of the fuel supply. A Bennett carbureter is used, and ignition is either by the Dixie high tension magneto or the Atwater Kent battery system. Lubrication is by a Madison Kipp force feed oiler with sight feeds. This insures equal lubrication of both cylinders as well as efficient lubrication of all the crankshaft and connecting-rod bearings. The cooling water is circulated by a rotary pump through an improved type of radiator at the front of the frame, behind which is mounted a radiator fan surrounded by a shroud.

At a speed of 750 r.p.m. the engine is rated to develop 18 hp. Gasoline is being used as the fuel at present, for, although the Ohio company has been testing a motor with special provision for the use of kerosene, it is not yet ready to market this outfit.

The engine sets on top of the frame, which is constructed of 5-in. channel steel. On an extension of the engine crankshaft are mounted the friction clutch and the belt pulley. The pulley is 11 in. in diameter and has a face of 6¾ in. From the clutch on the crankshaft, the power is transmitted



Transmission of Whitney tractor

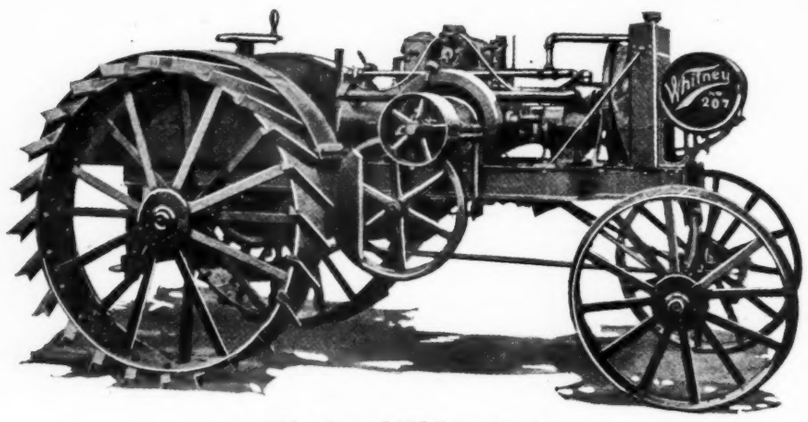
through a pair of spur gears at a considerable reduction to the transmision, which is hung underneath the frame. This is a three-speed sliding device and is mounted on Timken roller bearings. It is completely enclosed and the machine gears run in a bath of oil. There are three speeds in the gearbox. From the transmission the power is taken to the rear axle through a roller chain.

The reductions between engine crankshaft and rear wheels are 28:1 for the high speed; 39:1 for the intermediate, and 68:1 for the low speed. These reduction ratios correspond to speeds of 1¾, 2½ and 4 m.p.h. The low speed is for plowing in heavy ground, the intermediate speed for plowing in light soil and the high speed for road work. The engine power is claimed to be sufficient to draw a two-bottom plow under all conditions, with plenty of reserve power. The same clutch which is used for applying the driving power also operates the belt pulley, and this clutch is provided with a handy adjusting means which makes it possible to take up any slack in two or three minutes.

The front wheels are 30 in. diameter with a 5-in. face, and the rear wheels are 48 in. diameter and have a 10-in. face. The front wheels weigh 85 lb. each and the rear wheels without lugs 300 lb. and with lugs 378 lb. each. The rear wheels are regularly supplied with angle lugs, but road lugs can be readily attached and are supplied as an extra.

The front axle is of the automobile type, and the frame is spring-supported upon it, the axle being steadied by means of

Showing Whitney tractor at work drawing a 2 bottom plow



Side view of Whitney tractor

a triangular radius rod. Owing to the small diameter of the front wheels and the comparative height of the frame, it is possible to turn the tractor in a 23-ft. circle.

The driver's seat is spring-mounted, and consequently comfortable. It is so arranged that the steering wheel, which is located on top of a vertical post, as well as the clutch and gear levers, is within easy reach of the driver.

The tractor is a strictly one-man machine. Besides pulling two 14-in. plows at an average depth in any soil, the slow speed being used when the soil is particularly hard, the Whitney tractor will pull two 8-ft. binders or 5-ft. mowers, a hay loader and almost any other kind of implement. It is well adapted for light road work. On belt work it has power enough for driving a moderate-sized ensilage cutter, corn sheller, feed grinder, hay baler or small thresher, and it can also be used for such work as sawing wood, pumping water, cutting feed, etc. As a source of power it is of course much handier than a portable engine on skids.

A table of drafts required for different kinds of plowing has been compiled by the Ohio company. According to this it requires 375 lb. draft to pull one 14-in. bottom plow, 7 in. deep through corn stubble; 425 lb. through wheat stubble; 475 lb. through clover sod and 725 lb. through grass. It requires a draft of 775 lb. to break old sod 3½ in. deep with a 14-in. bottom plow. In plowing, the Whitney tractor may be run in the furrow by attaching the plow in different holes in the rear of the tractor. The length overall of the tractor is 123 in., the width 56 in. and the height 58½ in.

Equipping Motor Trucks for War Service

IT is reasonable to suppose that a motor vehicle just received from the factory is in the best mechanical condition and in all respects fit for immediate service. It is not in accordance with the military system, however, to send either trucks or touring cars direct from the factory to the front. Most of the Allied armies prefer to attend to the detail equipment of their motor vehicles themselves, rather than to leave this matter in the hands of the firm having built the chassis and the body. The nature of this detail equipment varies with the armies. In some cases the manufacturer delivers merely a chassis and body, these constituting a vehicle capable of running, but not in a condition to send to the front on active service.

When this is done, a special branch of the Motor Transport Service is entrusted with the task of completely equipping the trucks, this equipment comprising the lamps and lamp brackets, tools, spare parts, spare tires, reserve fuel tank, pick, shovel, rope, jack, sponge, bucket, cleaning material, and all other articles which are not an integral part of the vehicle.

After being equipped and individually inspected, the trucks are formed into groups or columns, and a traveling kitchen and a workshop are attached to each unit. An officer's touring car, and in some cases a motorcycle also, is allotted to the group, and finally the officers and men take over the set of trucks thus formed into a self-contained and independent unit capable of going into the field and maintaining themselves there for a considerable length of time.

In order to do this work vast numbers of motor vehicles have to be gathered together in a central open-air park. The more important of these parks often contain more than a thousand vehicles of several different makes, and in various stages of preparation.

One of the biggest of these parks, and the only one dealing with a single make of automobile truck, has been established by the French Army motor service at Turin in order to handle some of the trucks produced by the Fiat company. The Fiat factory testers deliver their finished cars and trucks to the officer in charge of this park, where they are equipped for active service, formed into convoys of eighteen or twenty, according to their tonnage, manned and officered and finally sent to the French army in Italy, or over the Alps, under their own power, to the army in France. There are three main types of vehicles in this big park: 1½-ton pneumatic-tired fast trucks, generally used by the aviation service, 3½-ton heavy trucks, and officers' cars.

Motor truck park of the French army in Italy

Hobs and Hobbing

Early Difficulties Overcome by the Ground Hob—Hobbing Process Especially Suitable for Quantity Production—Roughing and Finishing by Hob

By F. G. Hoffman and John Edgar

THE method of producing gears by hobbing has been understood in its theoretical aspects for many years, but conditions, which are now radically changed, delayed its general adoption until recent years. Unfortunately there has existed in the minds of many an exaggerated idea of the difficulties in using the hobbing process and a failure to appreciate its advantages, which may doubtless be traced more or less directly to the early conditions, and the change in the early conditions has not yet resulted in as complete a revision of the opinions founded on them as the facts warrant. It is the purpose of this paper to point out briefly what these early retarding conditions were, and to show how they have changed, and also to endeavor to be of some assistance in promoting a general understanding of the reasons that cause the present hobbing process to be so admirably suited to the high duty and high quality production now and the rule in your shops, particularly in regard to a range as to diameter and pitch, which though limited, nevertheless covers at least three-fourths of the production which is on a quantity basis.

One of the early conditions which retarded progress was the fact that quantity production in the present meaning of the expression did not then exist, and quantity production is the field to which the hobbing process is especially well adapted. The introduction of the automobile and its manufacture on a large scale necessitated the manufacture of duplicate gears in very large quantities, and thus afforded a chance for the hobbing process to show its capabilities, but it still lacked the refinements necessary to enable it to do high quality finishing work, and its field was in a considerable measure restricted to the roughing operation, but even with this restriction its use was large enough to furnish both the means and the stimulus to carry on development work, which has resulted in the refinements which to-day make it an eminently practicable and efficient method for the finest finishing work. These refinements lie principally in the *ground hob*, which will be more fully discussed later.

Review of Gear Cutting Methods

Prior to the advent of the hobbing machine, gear cutting machines were always operated on an intermittent principle. The rotary disk cutter method using formed milling cutters had the reciprocating cutter slide with its slow inward feed motion and the high-speed withdrawing stroke calling for a reverse mechanism, working under severe conditions and subject to great wear and tear. In conjunction with this mechanism and controlled by its motion is the indexing mechanism which also must operate at high speed with considerable jar and shock, which, with attendant wear, soon results in inaccurate spacing. The one favorable feature of this disk cutter method is the continuous cutting action, but even this advantage is open to the objection that the heating effect is concentrated at one side of the blank, the first cut being made in a cold blank, while the last one is with the blank at a considerably higher temperature, necessarily resulting in inaccurate work.

Operating on the generating principle are machines of the planer or shaper type, with a reciprocating cutting tool and intermittent indexing devices. Methods of controlling the reciprocating cutter to generate by rolling the blank are numerous and interesting. An early method was to generate one tooth at a time by rolling the blank past the reciprocating tool, returning the blank to first position and indexing for the next tooth. This method is obviously slow, and inaccuracies inherent in this periodical indexing have long been recognized, as has the local heating effect previously mentioned.

In the generating method represented by the Fellows shaper, the intermittent indexing is eliminated by the use of a pinion-shaped cutting tool rolling with the blank to give the generating motion and reciprocating to give the cutting motion, an additional short reciprocating motion being required to give clearance to the cutter on its return stroke. The mechanism that controls this rather complicated collection of motions is one of the most interesting to study but need not be detailed here. In operation the cutter is sunk into the blank to the depth of the cut desired and then the rolling mechanism is started, the gear being cut to full depth at one revolution of the blank, therefore the objection of local heating and unequal expansion of the blank, referred to above as characteristic of other methods, is not avoided in this one.

Characteristics of Ideal System

From a study of the methods above outlined, and a consideration of the advantages and disadvantages of each, it is apparent that an ideal system would have the following characteristics:

First—A continuous cutting action, as in milling with a disk cutter.

Second—Generation of each tooth by a single tooth or tooth profile, as in the single tooth generating process, so that each tooth will be a duplicate of its mates.

Third—Distribution of the cutting action around the blank so that an even heating may take place.

Fourth—Continuous indexing by rolling so that inaccuracies in spacing by intermittent methods may be eliminated.

Features of Hobbing System

A moment's consideration shows that the hobbing process has all these characteristics of an ideal system, for:

First—The cutting action of the hob is obviously a continuous milling cut.

Second—Each tooth in the gear is generated by the same set of teeth in the hob. An inaccurate hob may produce an incorrectly shaped tooth but even so, all of the teeth will be alike.

Third—Both work and cutter rapidly rotate, thereby assuring uniform distribution of heating and expansion.

Fourth—The indexing is continuous by rolling. Every revolution of the hob spaces cut a tooth on the blank as it rotates, in proper relation with the latter. The indexing is in no way affected by shock and jar as in the intermittent method.

It being accepted that the hobbing process combines these desirable features, the question then arises of designing a machine to give practical effect to them in the best manner. The trend to-day is toward specialization, as well in machine design as in human endeavor, and it is well recognized that making a specialist of a machine, while limiting the range of work to which it is applicable, is profitable for quantity production, because it increases its efficiency on the work within its range.

Applying this view to hobbing machine design, it seems apparent that by limiting the diameter of the gears to be cut to 12 in. and the diametral pitch to three, a machine can be produced having great rigidity for the kind of work expected

*Paper read at the annual convention of the American Gear Manufacturers' Association.

of it, and at the same time having a range sufficient to cover most of the quantity production. Rigidity is a prime consideration and it is important that the mechanism be plain and simple. The design must also insure long life by providing ample bearing surfaces and adjustment facilities for maintaining continued accuracy.

Being a manufacturing machine, speedy loading and unloading should be a main feature of operation. This will influence the design and the designer will find himself at the point where he must choose between the vertical and horizontal arrangement of the work spindle.

The vertical arrangement lends itself to machines of large capacity, as a more compact design can be worked out with this arrangement than is possible with the spindle in the horizontal position. But for a range of sizes up to 12 in. here considered, the horizontal arrangement has many advantages. In the quickness with which the work can be loaded, in combination with the stiffness that can be built into the work supporting means, the horizontal spindle machine is superior to its vertical type competitor. Cleanliness is another feature in favor of the horizontal spindle, as chips fall clear of the work support and do not hinder speedy reloading nor impair the accuracy of the results. Therefore, for the machine in view, the horizontal work spindle is superior. Having disposed of the work spindle and work support, the question of the hob support would next be considered.

Hob Support

This should be arranged with a minimum overhang and a simplicity of design that would give the results desired. The hob should be so mounted that it can be set at an angle to enable both spur and helical gears to be cut. Lateral adjustment without disturbing the hob on the arbor should be provided so that a quick and easy means is at hand to set the hob to bring successive places into the cutting range, thereby distributing the wear and allowing greater economy in the use of the hob.

From the first the hobbing process has proved itself to be a rapid method of producing gear teeth and for this reason its advocates have had little difficulty in demonstrating its ability for roughing, where quantity is required. Present day figures on this kind of production are such as to place it in a class by itself. The reason for this is to be found largely in the nature of the hobbing cut itself, which has the advantages of being a continuous cut, of breaking up the chip, of operating on a rotating blank, thus equalizing the load, and distributing heat, of having no portion constantly under cutting action, thus facilitating heat radiation and dissipation, and of distributing the load upon a great many teeth, no tooth removing metal its whole depth, therefore facilitating a rapid and complete circulation of the cutting compound. In addition to these advantages, the constant rolling indexing method of spacing the teeth allows a much higher operating speed than is practicable with intermittent spacing devices, and constant motion of all mechanisms in one direction permits higher speeds than would be possible on long runs with reciprocating mechanisms, at the same time greatly reducing wear.

Finishing by the Hobbing Process

But roughing is not all. Gears require to be finished and finished with a high degree of accuracy. In the earlier days of the hobbing art the demand for accuracy in finishing gears was not nearly so severe as at present, and the use of carbon steel in the manufacture of hobs did not introduce the difficulties that are found where high speed steel is employed, but even at that the hobbing process was at a disadvantage in the finishing operation, because of the difficulty in producing sufficiently accurate hobs.

Later as the demand for accuracy in the gears increased, and as the use of high-speed steel became a necessity in the race of economical production, the relative disadvantage of the hobbing process in finishing became more marked, and to-day for high class finishing it would be out of the race entirely if there were no means available for correcting the hobs after hardening. Fortunately such a means exists to-day, and the result of the use of this means is the modern *ground hob*, in which not only are the inaccuracies introduced by hardening eliminated, but a greater degree of accuracy is attained than is possible, even in the soft, by ordinary machining methods.

The Hob Grinding Process

The development of the hob grinding process to its present high state of refinement has been no easy matter, as several hob manufacturers know to their cost. The experimental and development work required several years and suffered many disappointments. It involved refinements much more difficult to obtain than those necessary in the hobbing machine, but the final results are so satisfactory that the advocates of hobbing claim, and can show, results superior in the matter of accuracy, all things considered, to any other method. Furthermore, duplicate hobs of any form can be made with reliability and certainty, and the hob can be set to cut on any part of its surface without changing the result in the finished gear, so that the whole wearing life of the hob can be utilized, whereas with hobs that are not ground, the distortion of hardening often results in there being one point on the hob which will produce good results, whereas no other place on the hob will do so.

Formed Hob for Roughing

The hob which is formed and not ground is still recognized as the proper tool for roughing and it may be used for some classes of finishing, but not where a high quality is required, for although it will make all the teeth in the gear alike, it cannot be relied upon to give an accurate tooth shape unless every tooth in the hob follows in proper relation, without zig-zagging from the theoretical path. There are a number of causes that account for the zig-zag or drunken path that the hob tooth of an unground hob may take. Reviewing the operation through which the hob passes to its completion, we find in each operation a chance for a small error that in the aggregate may show a wide variation from the true generating path.

First—Sharpening is a cause of wide variation in the relation of one tooth to its adjacent mate, but is corrigible to a degree that reduces the error from this source to a minimum. The teeth of the hob must necessarily be equidistant from the axis at the cutting edge to get a continuous true relation of one to the other.

Second—Hardening is most difficult to control as the materials hobs are made of require high heats and cold quenching, setting up strains that cannot be predetermined.

Third—Hole grinding is also a cause of variation. This, however, is corrigible to some extent in sharpening.

Fourth—Relieving the thread is often the cause of error, even though the operation is performed on heavily constructed machines. The material is not always ideal in working qualities, no matter how carefully the steel is manufactured, heated or treated, and variation in hardness, even in the same bar, is a cause of error.

These difficulties have defied the art of the hob maker and forced him to resort to grinding, which at first seemed impossible, but which to-day is entirely successful and practical. The resulting combination, giving rapid production and highest quality at the same time, makes the hobbing process, as its advocates claim and show, the superior of any method for finishing, as well as for roughing; in fact, the superiority of the process is to-day greater in finishing than it is in roughing, for not only is the quality superior, but the gain in speed over other methods is greater in finishing than in roughing.

Work Holding Means

Of almost equal importance with design and construction of the hobbing machine comes the work holding means. Manufacturing work necessarily implies long runs and special equipment suitable to adequately take care of the peculiar conditions in each particular case. Little can be said in a general way as to this equipment, as each case must be considered on its own merits.

Aside from the production of spur and spiral gears, the hobbing process has a further field in which the recognition of its superiority has been more prompt. This field is the production of spline shafts, which have come into such com-

mon use in automobile construction, and which are now being more and more adopted in other lines. The spline shaft owes its popularity, and, from a manufacturing standpoint, its practicability, to two processes, pull breaching and hobbing.

Producing Spline Shafts

Hobbing is particularly well adapted to spline shaft generating, as in this work the uniform distribution of the heating effect is even more important than in cutting gears, and added to this is the fact that in making spline shafts by milling with intermittent indexing methods, the releasing of surface strains from one side of the shaft at a time throws the shaft out of true and makes accurate results extremely difficult to attain. Not so in hobbing, because the stock is gradually removed from all sides at once, working progressively from one end, the effect of the removal of stress resisting material is balanced, and no distortion takes place.

Besides these important features, we have the accurately indexed keys, each a duplicate of the other, with off center keys eliminated, and added to all this is the high rate of production. There is no limit to the number of keys it is possible to hob with little or no increase in production time for shafts of equal diameters. This has undoubtedly led to the present wide adoption of shafts, particularly for axle drives, with eight, ten or more keys, giving a greater root diameter for a given key driving strength, the accurately indexed splines distributing the load evenly.

Another field that the *ground hob* has opened for hobbing is the silent chain sprocket. Sprockets of a large number of teeth have been handled quite successfully by the formed hob, but those with a small number require the greater accuracy of the *ground hob*. Hobs are used extensively to cut teeth in roller and block chain sprockets. These are usually range hobs, each covering a small range in numbers of teeth possible with each hob.

Special cases of hobbing also include those in which teeth in ratchets, slotting saws, burrs, etc., are generated. Hobs may be made to generate almost any toothed section that has teeth equally spaced on a cylindrical base. It is not necessary that the teeth be symmetrical on an individual axis, but each must be a duplicate of every other, or the teeth must be in alternate groups.

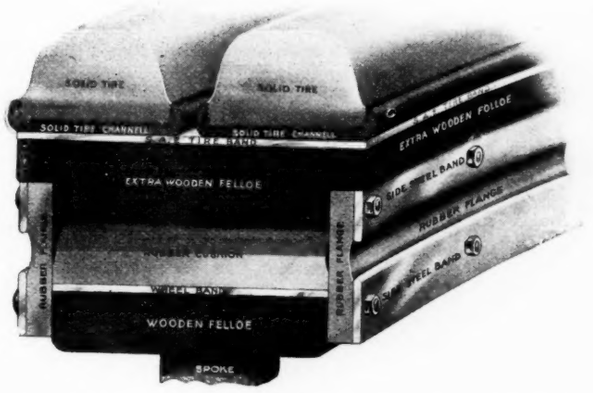
Sewell Cushion Wheel in Quantity Production

BY additions to the plant of the Sewell Cushion Wheel Co., it has been possible to put the production of cushion wheels on a quantity basis to the extent that during the year 1917 the sales totaled over $750,000. The business in 1910 amounted to $3,000, and in 6 years increased to $310,000. A reinforced concrete factory has been added to the original plant, giving an area of 50,000 sq. ft., of which 15,000 is made up by the old factory now used as storage space. The Sewell cushion wheel is used on thousands of public utility and commercial trucks and by 151 cities and towns on their motor fire equipment.

The construction of the wheel is made clear by the illustrations herewith. The novel feature consists in interposing live rubber cushions between the outer and inner wheels. In addition to this there are rubber flanges which act as a seal inclosing the rubber cushions in a water-tight and air-tight housing, which is also light-proof and acts as a flexible driving connection between the inner wheel and outer felloe.

The rubber cushions, since they are not subject to any abrasive action due to road contact, can be made of a quality of rubber having a high resiliency. In rubber tires it is necessary to compromise between resiliency and toughness and this limits their cushioning action. The weight of the load is distributed over 40 per cent of the rubber cushions, which are 94 per cent pure Para.

With the rubber flanges bolted to both the inner and outer wheels, or inner and outer felloes, and the cushions placed between the felloe bands, there is no connection between wood and wood, steel and steel, or wood and steel, except through rubber. For referring to the illustrations, it will be noted that there are two steel bands on each side of the wheel, the outer bands being bolted through the outer rim, and the inner bands through the felloe of the inner wheel. The side steel bands extend over the rubber flanges and cushion from above and below, and are bolted to the felloes to prevent side motion and to keep the wheel true.



AUTOMOTIVE INDUSTRIES
The Automobile

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Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
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Chicago—Mallers Bldg., 59 East Madison St., Phone Randolph 6960
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Cable Address - Autoland, New York
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National Trade Marks

AT the present time there is a strong tendency to adopt national trade marks to prevent misrepresentation and the pirating of the good-will of a nation's industries by traders of other nations. Recently an agreement was entered into between the French and British governments regarding a French national trade mark, and in this country a delegation of representatives of commercial organizations appeared before the House Interstate Commerce Committee to urge the adoption of such a trade mark for the United States.

There is the same justification for national trade marks as there is for private trade marks. When a firm engages in business in any line and by dint of painstaking work and fair dealing slowly builds up a representation for itself, it is entitled to government protection against unscrupulous competitors who might imitate its goods in appearance or attempt to sell their products under its name. This protection is provided by the trade-mark law. Similarly, when a nation establishes for itself a reputation in any particular line of industry and a demand for its products is created in foreign countries, it feels that it should have some means of protecting itself against other nations which may attempt to pass off their inferior goods under its name. Even if the goods sold under false pretensions were of good quality, it would be unfair competition, but if they are of inferior quality, as is generally the case, the practice tends to destroy the reputation of the nation imposed upon and do it double injury.

To a certain extent the phrase "Made in U. S. A.," which has been widely used in late years, serves the purpose of a national trade mark, but it is evidently believed that some simple distinctive mark would meet the requirements better.

It is quite obvious that after the war the business ties that were severed when war was declared will be very hard to build up again. For one thing, every nation will be carrying a heavy burden of war debt, and there will be a strong disinclination to import from foreign countries any materials or products of manufacture which can be produced at home or which are not necessary to the national economy. There will be a particularly strong aversion to the goods of the late enemy, and it is to be expected that unless the government at the instigation of the business interests of the country provides a means of identifying merchandise according to the country of origin, before the end of the war, this will then be demanded by consumers.

In connection with the proposal for the establishment of a national trade mark there arises the problem of preventing its piracy in foreign countries. It would seem that the only solution of this problem would be the establishment of an international convention similar to the international copyright convention.

The Lens Situation

TWO or three years ago an agitation for the control of headlight glare began in the East, and several states put laws on their statutes requiring the lighting equipment of every car to meet certain specifications. Difficulties in the enforcement of these laws soon arose, however, and in some of the states the law is now practically a dead letter. In other states, however, notably New Jersey, it is rigidly enforced.

There was never more need for uniform legislation pertaining to automobile matters than there is now in connection with the headlight control problem. If there were uniform requirements with respect to glare control in all of the states, manufacturers could equip their cars with a lighting set that could be used without change anywhere. As it is now this is impossible.

There should be no great difficulty in enforcing light control laws if devices for the purpose were submitted to tests, and if found suitable approved by the Bureau of Standards at Washington. Such a procedure would also serve to eliminate inefficient devices at the outset and thus protect the motoring public. There may be wide differences of opinion as to the desirable intensity of illumination, but this will always remain so, and an average should be struck and action taken on that basis.

The Red Cross Appeal

By David Beecroft

THOSE whose conception of the Red Cross is that its sole duty is to care for and minister to the wounded must revise that conception.

Caring for the wounded is only one of its almost myriad activities. While it may have been primarily intended for this work, it is now broadened far beyond the original plans.

To-day the Red Cross is providing food and clothing for those needy in France who have been dispossessed from their property and belongings in the war zone.

To-day the Red Cross is building houses and furnishing them for those who have lost all that they once owned, and whose husbands, brothers and sons are in the war.

When France entered the war she had 24,000 doctors, great numbers of whom immediately went to the front. The home ranks were so depleted that cities of 30,000 population did not have a doctor. The Red Cross, realizing the seriousness of the situation, organized traveling corps of doctors and nurses, who visited all French cities that were without adequate medical attention, held free clinics and gave other necessary medical assistance.

During the 3½ years of war Red Cross nurses have visited the homes of practically all French soldiers and ministered to the sick wherever it was found necessary.

To cite a specific example of the work that fell upon the Red Cross: One village of 467 houses had 430 of them destroyed by the Germans in revenge for the place having been held for nearly 3 days by sixty French machine gunners, who held off the entire German forces. Instead of killing the population outright the Huns merely wounded them so as to make the load of caring for them fall more heavily on France. The Red Cross organization took entire charge of the relief work, not only caring for wounded but also clothing, feeding and housing the population.

The $100,000,000 which the Red Cross is endeavoring to obtain in the drive during the week of May 20 to 27 will be devoted exclusively to a continuation of this broad humanitarian work.

Red Cross officials have stated that for every $1 subscribed there will be approximately $1.02 devoted to this work in France. The extra 2 cents is an interest accumulation.

This $100,000,000 will accomplish much more than the same amount in an earlier period of the war because the whole machinery for the administration of the work has been built up throughout France. All of the money required for it has been expended.

Not one cent of the present $100,000,000 subscription will be used for Red Cross salaries or Red Cross maintenance or any other Red Cross overhead expenses. All of these charges have been cared for by the funds raised through Red Cross memberships and by other donations. Every cent subscribed goes *in toto* for the relief of the Allied forces and those dependent upon them.

With such a record, and with such an objective, there could be no stronger appeal for every factory organization to make to every employee. This subscription offers the first opportunity to the American workmen in the factory, in the foundry, and in all other departments of factory organization to contribute to his fellow Ally who is carrying the load in France.

There are two armies engaged in this conflict: The army with rifles and bayonets and machine guns and field artillery, and siege guns, and tanks, and airplanes, and balloons, and trucks, and motor cars, and a thousand other instruments of war who are holding the line on the Western front.

There is the army of workers in America. These are in the factories making all of the war apparatus and other apparatus to keep the industries of the Allies going. There is the army of workers on the farms raising the necessary food products. There is the army of workers in the mines furnishing the necessary raw materials. There is the army of workers in our forests supplying the timber for airplanes, ships, etc. There is the miscellaneous army scattered all over the country doing its direct work for the war. The armies at home must support the armies in the field.

Every merchant must make his sacrifice for the Red Cross drive. It is up to every factory organization to see that the story of the Red Cross is told to every workman in its employ.

This is the first opportunity for real sacrifice on the part of the great armies of industry at home that are providing materials for the army at the front. It should not be a weak sacrifice. It should not be a small one. It should be in proportion to the work the Red Cross has done. It must be liberal. It must be given in the spirit of war. It must be given in the spirit that the armies abroad are giving their time and their greatest sacrifice of all—life.

□ Latest News of the

Makers Pledge Help to Government

Curtailment Questions Not Definitely Decided—Need Much Steel for Ships

WASHINGTON, May 13—There will be no specified curtailment of the automobile industry. Automobile manufacturers have agreed with Government officials that war needs demand 100 per cent priority on steel and other materials required for munitions manufacture. The committee, composed of W. C. Durant, General Motors Co.; John Willys, Willys-Overland Co.; John Dodge, Dodge Bros., and Walter Flanders, Maxwell Motor Co., completed negotiations with the War Industries Board with the understanding that the Government will take steel and whatever other materials it needs up to 100 per cent and the automobile manufacturers will arrange their programs accordingly. They will use their proportion of the steel that is left over pro rata with other non-war manufacturers. Each company has been advised by the committee to consider its production and program problems in view of this arrangement.

Not Responsible for Curtailment Rumor

The committee was informed by the War Industries Board that there had been no official attempt to set the curtailment to 75 per cent, as had been indicated by newspaper dispatches. The War Industries Committee denied all responsibility for this statement.

The conference included arguments on the part of the automobile committee to the effect that labor would be thrown out of work, huge organizations disrupted, making them inefficient for war work, and that financial disaster of a $2,000,000,000 industry would result from a drastic curtailment.

When the War Industries Board officials condemned the severe reduction in passenger car manufacture it was pointed out that they had been in error previously, that the shortage situation might clear up in the next 90 days, that the Government did not actually know its own requirements for steel and other materials, and that a severe curtailment might mean the destruction of the huge industry unnecessarily. When the Government officials persisted, the automobile committee stood pat.

It stated that it would not set a curtailment figure but would force the responsibility for any such drastic curtailment upon the War Industries Board. In view of its own lack of knowledge of steel and other material requirements the board hesitated to set a specified drastic curtailment which might be unnecessary and in the near future bring severe criticism upon the War Industries Board with the result stated above: That there will be no specified curtailment but instead an arrangement whereby the Government will have full priority, with automobile makers taking what materials are left for use in production of automobiles.

It was agreed that this plan was by far the best. It prevents all hysteria and panic in the industry, and especially among the 27,000 dealers; it gives the Government all of the materials it needs, yet it allows the automobile industry to run up to normal production as speedily as the shortage situation clears up.

—

Banking Interests Control Gaston, Williams & Wigmore

NEW YORK CITY, May 16—Interests identified with the Guaranty Trust Co. and the Chase National Bank have bought a controlling interest in Gaston, Williams & Wigmore, Inc., importing and exporting company. Harry Payne Whitney, a director of the Guaranty, and G. M. Dahl, vice-president of the Chase, have been elected directors to represent the new affiliations. William A. Williams and J. A. Wigmore, vice-presidents of the company, have resigned as directors. A substantial amount of their holdings was bought by the banking interests.

—

Overland Has Four Government Orders

NEW YORK, May 16—The Willys-Overland Co., Toledo, is now producing between 400 and 500 passenger cars a day, is planning to manufacture a ¾-ton truck and also a larger model equipped with a Knight engine and is working on four large contracts, three of which are for the United States and one for the British government. The English order is for 1000 Sunbeam engines and is being filled at the Toronto, Ont., plant. The American orders are for 5000 Curtiss OX-5, 8-cyl., training engines which are to be turned out at the Elmira plant; 3000 gun carriages which are being made at Toledo and a $10,000,000 order for machining large size shells at the same plant. These facts were given out by President John N. Willys at the annual meeting of the company. The company has already delivered more than half of the order for Curtiss engines, 835 being delivered in March and 1003 in April; it is expected that by this time the company will have exceeded its contract schedule. It is planned to deliver 1000 engines each in May and June.

Inaugurate Airplane Mail Service

Two Machines Carrying Batches of Letters Make First Postal Trip Successfully

NEW YORK, May 15.—What will undoubtedly prove a most important event in the history of the transmission of intelligence took place at Belmont Park, near Jamaica, L. I., this morning, when the first batch of aero mail was taken into the air. The machine which carried the mail was a Curtiss JN-48, equipped with an Hispano-Suiza 150 hp. engine built in this country. It was piloted by Lieutenant Torey Webb, and left Belmont Park promptly at 11.30 a. m. About 140 lb. of mail matter was stowed away in a compartment in the body in front of the driver's seat. Two machines were on hand, one being held in reserve for use in case of a hitch with the other.

According to the schedule laid down, the machines which took the air were to carry the mail to the Bustleton Flying Field, located ten miles north of Philadelphia. There the mail was to be transferred to another machine of the same type, which, piloted by Lieutenant J. C. Edgerton, was immediately to continue the trip to Washington.

About the same time that Lieutenant Webb left Belmont Park another machine, piloted by Major R. H. Fleet, left Washington for New York. This machine, too, was to stop at the Philadelphia station and its load of mail was to be taken over by Lieutenant Howard Culver on another machine. Three reserve pilots or substitutes had been provided, namely, Lieutenants Edward Boyle, Walter Miller and Stephen Bonsal.

The machine which left New York arrived in Philadelphia at 12.30 p. m., where the mail was relayed by another plane, and arrived at Washington at 2.50 p. m. The actual flying time of the two aviators, deducting 6 min. for the relay at Philadelphia, was 3 hr. 20 min. Mail which left Washington was carried in a special train on the Long Island Railroad from Belmont Park to the New York Post Office at 33rd Street and Eighth Avenue, where it arrived at 4.12 p. m., beating the railroad time by about 1 hr. and 15 min.

For the present it is the intention of the post office to accept only first-class mail. Small parcels, however, in which the combined dimensions of length and girth do not exceed 30 in., will be accepted. On days when the weather forbids flight mail will be transported by

(*Continued on page* 970)

Automotive Industries

All Farm Equipment Under License

Manufacture and Importation to Be Controlled for Food Conservation

WASHINGTON, May 15—Special Telegram—The importation, manufacture and storing for distribution of all farm equipment, including tractors, trailers and trucks, and all other tools utilized and machinery required in the production of food, will be licensed on and after June 20, 1918, in accordance with a proclamation to be issued by President Wilson tomorrow. An act of Congress approved by the President August 10, 1917, to encourage production, conservation of supplies and control of distribution of food products grants the President such power and authorizes him to place these businesses under license or other regulations as he sees fit.

The President's proclamation will state that all individuals, partnerships, associations and corporations engaged in the business of importing, manufacturing, storing or distributing farm equipment are required to secure licenses on or before June 20, 1918. The Secretary of Agriculture will carry both the provisions of the act and the proclamation into effect. Application for licenses must be made to the Law Department, License Division, U. S. Food Administration, Washington, D. C.

The plan is designed to prevent scarcity of food, hoarding, injurious speculation and manipulation and provide control of the food supplies during the war. The general regulations governing the licenses as outlined by President Wilson include the following:

All licenses shall be signed by the Secretary of Agriculture and are not transferrable. Each licensee must give any representation to the Secretary of Agriculture whenever required, and any information concerning his business, including information regarding transactions of any farm equipment imported, manufactured, purchased, contracted for, received, sold, stored, shipped or otherwise handled or distributed.

Each licensee must keep his record in such form as to make practicable the verification of all information given by him to these regulations. No agent of the Secretary of Agriculture shall, without the concent of the licensee, divulge except to other agents or employees of the United States, any information regarding the business of any licensee acquired through inspection of that business.

A licensee shall not import, manufacture, store, distribute, sell or otherwise handle any farm equipment at any unjust, exorbitant, unreasonable or discriminatory commission, profit or storage charge.

A licensee shall not resell any farm equipment within the same trade without reasonable justification. Any such resale without reasonable justification results in higher maket price and will be wasteful practice.

A licensee will not sell, store or otherwise handle farm equipment for the purpose of unreasonably increasing the price or restricting the supply or monopolizing the commodity. A licensee will not commit waste in connection with the handling of any farm equipment. Each licensee must notify the Secretary of Agriculture within 10 days thereafter of any change of address, management, control or ownership of the business of the licensee.

The licensee shall not, without the express sanction of the Secretary of Agriculture, sell any farm equipment to any person engaged in the selling or utilizing of such commodity if the licensee has knowledge that such person has violated the provision of the act of Congress under which these regulations are prescribed by making unjust or unreasonable rates or by holding contracts for or arranging for quantities in excess of the reasonable requirements of his business for use or sale by him for a reasonable time.

A licensee shall not make any misleading representation which tends to enhance the price of farm equipment. The issuing or making of public market quotations for, or any statement regarding the price of farm equipment being sold, which quotation or statement shall not be verified from the records of licensee or other licensee, will be considered misleading representation.

Every tractor and trailer manufacturer, distributer and dealer through the country will have to go under license from the Government. All farm implements are included.

—

Hughes To Investigate Aircraft

WASHINGTON, May 16—Charles E. Hughes, former governor of New York State is to take an active part in the investigation regarding aircraft matters which is to be made by the Attorney-General. President Wilson has invited Mr. Hughes to associate himself with Attorney-General Gregory and Mr. Hughes has accepted the invitation. Mr. Hughes will conduct a legal investigation under the nominal direction of the Attorney-General with a view to ascertaining the charges made by Gutzon Borglum justify criminal proceedings.

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Chalmers To Continue Duties

WASHINGTON, May 15—Hugh Chalmers, special representative of the National Automobile Chamber of Commerce in Washington does not, as recent published reports indicated, contemplate severing his Washington connections. Mr. Chalmers has considerable important war work before him. His duties include binging the automobile industry into direct contact with those government departments requiring munitions manufacture and seeking manufacturing facilities and bids. It is likely that the report that Mr. Chalmers would give up his Washington work was due to the fact that the curtailment meeting was held and completed last week, but acting as the point of contact between the War Industries Board and the Automobile Committee has been only one of Mr. Chalmers many Washington functions. Mr. Chalmers will possibly be in Washington less during the next few summer months but there is no thought of his giving up the work he has so thoroughly performed to this time.

General Electric Gets Bijur

Pays $300,000 Cash with Promise of $200,000 More—Reorganize Company

NEW YORK CITY, May 15—The General Elecrtic Co., has purchased the Bijur Motor Lighting Co., and is, by the terms of purchase, paying $300,000 of new money into the company at once, and later will advance $200,000 additional whenever it is required. This total investment of $500,000 is to be represented by the first preferred stock. Joseph Bijur and his operating associates will continue with the new company. The manufacture of the Bijur line will be continued as heretofore, and enlarged to take care of new business.

In order to complete the transaction and arrange for the reorganization under the General Electric, which controls more than 50 per cent of the stock, it was necessary to secure from the United States District Court permission to transfer the assets of the Bijur company to the new company. On May 14 the case came before Judge Martin H. Manton of the United States Circuit Court, when the transfer of the new company was ordered. All of the creditors and stockholders had been duly notified and unanimously approved of the transaction, there being no objection from any of the creditors or stockholders.

The plan of reorganization provides that the old preferred stockholders are to receive second preferred stock in the new company, which plan has been approved by all of the stockholders and substantially by all of the creditors. Under the reorganization, the financial policy will be under the general supervision of the General Electric Co., which will have representatives on the Board of Directors.

The present reorganization and securing of control by the General Electric Co., dates back to January of this year when it was necessary to have Joseph Bijur, president, apply for a receivership.

Following the receivership, efforts were made looking toward a reorganization of the company, but an unexpected obstacle was presented when the Government notified the receivers that the large factory which the company occupied would be needed for the manufacture of war materials by the Ordnance Department, and shortly thereafter commandeered the premises.

A stockholders' committee was organized, of which Walter C. Allen was chairman and Messrs. Rosenberg and Bell were counsel, to work out the plans.

Tire Size Schedule Approved

Manufacturers Through N. A. C. C. Accept Action of War Service Committee

NEW YORK, May 13—Automobile manufacturers, through the National Automobile Chamber of Commerce, have formally approved the schedule of 9 standard sizes of pneumatic tires drawn up by the War Service Committee of the Rubber Industry of the U. S. A. These 9 sizes, including 30 x 3½, 31 x 4, 32 x 3½, 33 x 4, 34 x 4½, 35 x 5, 36 x 6, 38 x 7 and 40 x 8, are to be used in equipping all passenger and commercial vehicles up to 2 tons capacity.

The suggestion that the number of sizes be reduced to these 9 standard sizes from more than 200 sizes which now are made came originally from the Commercial Economy Board of the Council of National Defense. Car manufacturers have been asked to use only these sizes on cars produced after July 31, 1918. The complete adoption of the schedule eventually will mean a great reduction in the number and size of tires which must be produced by manufacturers and carried in stock by dealers. In addition to eliminating about 100 sizes, the schedule also does away with all styles of beads except clincher, which is used for only the 30 x 3½ and 31 x 4, and straight side, which is used for every other size. Quick detachable and Q. D. clincher are eliminated.

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Tillotson Output Increased

TOLEDO, May 14—During 1916 the Tillotson Mfg. Co. produced 175,000 carbureters as compared with 50,000 for 1916. In the three years ended 1917 350,000 carbureters were built and shipped. The present plant now employs about 300 people. The company is just getting into production on war work and will soon be emloying 400 or 500 men.

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Traction Motor Officials Elected

KALAMAZOO, MICH., May 13—The Traction Motor Corp. has completed its organization by the election of George L. Erwin as president of the company. Other officers are: Vice-presidents, Edmond Hans, Kalamazoo, and Myron H. Powell, Muskegon; secretary-treasurer, G. J. Wagner, Grand Rapids. The board of directors includes the officers and William Munroe and W. E. Jeannot, Kalamazoo. Material is being rapidly turned out for the first 25 tractors.

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X-Cel-All Officials Elected

ALMA, MICH., May 13—At the annual stockholders' meeting of the X-Cel-All Co., manufacturer of paint and varnish, the following officers were elected: President, T. A. Bamborough; vice-president and general manager, M. A. Bamborough; secretary, H. W. Vane; treasurer, H. J. Masselink; merchandising manager, Otto Sanderhoff; superintendent of buildings, B. F. Getchell. The officers, together with D. A. Kitch, of Chicago, make up the board of directors. At the meeting the name of the company was officially changed from the Ex-Cel-O Co. to X-Cel-All Co.

The company expects to start work very shortly on an additional building for storage and shipping purposes.

The White Co. has declared the regular quarterly dividend of $1 a share, payable July 1.

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Biggam Trailer Gets Government Order

CORUNNA, MICH., May 13—The Biggam Trailer Corp. is now in production on a Government order for 500 trailers for the aviation department.

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Waist and Dress Men Start Motor Truck Line

WASHINGTON, May 13—The Waist and Dress Manufacturers Assn. of Philadelphia will organize a line of motor trucks to operate daily between Philadelphia and New York City. The Philadelphia manufacturers ship large quantities of material to New York, and receive correspondingly large quantities from New York.

It is proposed that when this line is established it will be used in much the same way as a Return Loads Bureau carrying merchandise between New York and Philadelphia. The truck line, when established, will be advertised among the New York trade to the effect that deliveries can be made on certain daily schedules from Philadelphia. George W. Haney, president of the Waist and Dress Manufacturers Assn. of Philadelphia, is promoting the motor truck plan.

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To Drop Some Farm Implements

WASHINGTON, May 14—The Commercial Economy Board of the Council of National Defense has undertaken the study of farm implements to determine which ones may be dropped by manufacturers without hampering farm work. Questionnaires have been sent to various associations to learn which implements can be taken off the list to conserve materials, labor, capital and manufacturing facilities for war use.

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Peerless Prices Advance

CLEVELAND, May 13—New prices on Peerless cars went into effect May 1 as follows:

	New Price	Old Price	Increase
Touring Car and 4-Passenger Roadster	$2550	$2340	$210
Coupe	3050	2850	200
Sedan	3250	2990	260

Other prices remain the same.

Export Licenses Are Restricted

Exports to Allies Must Be Approved by War Mission Before License Is Granted

WASHINGTON, May 11—To prevent useless consumption of materials and labor in manufactured articles for export that are now restricted and also to save ship tonnage by prohibiting the exportation of such articles, the War Trade Board has adopted the following rules and regulations regarding issuance of licenses to export commodities to the United Kingdom, France, Italy and Belgium (excluding their respective colonies, possessions and protectorates).

1—On and after May 15, 1918, applicants before filing applications for license to export any commodity to the above named countries must obtain thereon the written approval of the mission in the United States of the country to which the exportation is to be made. To secure this approval applicants should forward their applications, duly executed, in triplicate, with proper supplemental sheets attached thereto, including Supplemental Sheet X-11 or X-12 as may be required, to:

a—The British War Mission, Munsey Building, Washington, D. C. For shipments to the United Kingdom.
b—The French High Commission, 1954 Columbia Road, N. W., Washington, D. C. For shipments to France.
c—The Italian High Commission, 1712 New Hampshire Ave., N. W., Washington, D. C. For shipments to Italy.
d—The Belgian Commission, Room 202, Council National Defense Building, Washington, D. C. For shipments to Belgium.

One copy of approved applications will be forwarded by the Missions directly to the Bureau of Exports, Washington, D. C.; one copy retained, and the other copy returned to the applicant for his convenience in keeping a record.

Applicants will be required to agree with the War Trade Board not to purchase or acquire for export or to take any steps in the process of producing, manufacturing or fitting for export the articles specified in the application until an export license has been duly granted.

Shippers of articles contained on Schedule A, set out below, will also be required to agree that after export licenses have been issued they will not make any purchase or acquire for export, or take any steps in the process of producing, manufacturing or fitting for export the articles specified in the application unless they first obtain the written approval of the United States Food Administration or of the United States War Industries Board.

Applicants should use Form X, together with any supplemental information sheets required by the Rules and Regulations of the War Trade Board, and in addition thereto Supplemental Information Sheet X-11.

If, prior to May 15, 1918, any of the articles specified on such applications were purchased or acquired for export, or if any steps were taken in the process

of producing, manufacturing or fitting for export such articles, applicants must agree that, after export licenses have been issued, exportation thereunder will not be made until written approval of the United States War Industries Board has been received with respect to articles specified in Schedule "A," or of the United States Food Administration with respect to foodstuffs, fodders or feeds. In such case the applicant should use Supplemental Information Sheet X-12 in place of Sheet X-11.

Applicants should not apply to the United States War Industries Board or to the United States Food Administration for approvals until they are actually in receipt of export licenses.

On July 1, 1918, all outstanding licenses granted on or before May 14, 1918, will be revoked. Any goods not then exported against such licenses may thereafter be shipped only if licenses are secured after being applied for as above set forth.

Schedule "A" as of May 13, 1918, is as follows:

Aluminum (metal)
Asbestos
Boilers—High Pressure Steam
Carbon Electrodes
Chemicals as follows:
Acetates, all
Acetic Anhydride
Acetone
Arsenic compounds, all
Carbon disulphide
Chrome compounds, all
Cyanides
Manganese compounds, all
Nitrobenzol
Potassium salts, all
Pyrites
Cromium Ore
Copper—Metal
Copper Wire and Cable
Ferro Alloys, all
Graphite (crucibles and electrodes)
Iron and Steel Products, consisting of:
Billets
Blooms
Boiler Tubes
Ingots
Pig Iron
Plates
Sheet Bars
Slabs
Tin Plate
Wire Rope
Lumber, all kinds
Machine tools as follows:
Slotters (all sizes)
Grinders (Internal, Plain and Universal)
Boring Machines (horizontal and vertical)
Boring Mills
Lathes (30-in. swing and larger)
Milling Machines, (No. 3 or Universal and larger)
Planers (all sizes)
Radial Drills (4-ft. arm and larger)
Manganese compounds, all
Manganese ore
Mercury
Mica
Nickel (Metal)
Tin (Pig or Block)
Tungsten, tungsten steel and ore
Wolframite

To Make Metal Parts

DETROIT, May 14—The American Metal Products Corp. has been organized here by Stephen Marossy. Frederick C. Matthaer and Roy H. Curtiss.

Gasoline Production Increases

Steady Rise in Daily Output and Stocks on Hand in January and February

WASHINGTON, May 14—Average daily production of gasoline during January increased almost 2 per cent over December, 1917, and the February average daily production showed a 6 per cent increase over January, according to figures compiled by the Bureau of Mines. The January total production in gallons was 234,714,062, and the February total 225,823,365.

Production of kerosene, on the other hand, showed a marked decrease. The average daily output for 1917 was 4,389,082 gals. In January this was only 3,707,314 and in February 4,182,434 gals.

The output of practically all forms of oil was smaller in January than in December, with the exception of gasoline. Crude oil and distillates fell off from 24,534,726 bbls. in December to 23,198,978 in January and 22,798,635 in February. Lubricating oil was produced at the rate of 1,977,109 gals. daily during 1917, as compared with 1,764,721 gals. in January. In February, however, the output increased 8 per cent over the January figure and 4 per cent over the December amount.

There was a large increase in the amount of stocks on hand during these two months, practically every kind of oil being stored away in great quantities. On Dec. 31 there were 412,256,833 gals. of gasoline in reserve. On Jan. 31 this was increased to 469,277,166 gals., a gain of 14 per cent. On Feb. 28 the stock on hand was 518,794,609 gals., or 11 per cent more than the amount on hand a month previous.

Grossman Men in Convention

NEW YORK, May 13—The salesmen of the Emil Grossman Mfg. Co. have been in convention here May 10-13. The convention included meetings at the Astor, visits to the company's plant, to the J. Walter Thompson advertising agency, and to the Trenton pottery where porcelains are made. Those who attended were:

Emil Grossman, president; L. M. Schwartz, vice-president; J. N. Lowe, H. G. Wedler, W. M. Farans, L. Rosenberg, R. Cony, M. A. Edlis, F. R. Dworak, C. B. Charmatz, C. E. Lund, G. S. Salomon, Jos. Sacks, Chas. Weinberg, S. S. Frank, S. Prince, L. V. Hansen, J. Burke, R. L. Thornton, Thos. J. Irving, S. H. Richey, D. M. Lay, John U. Reber, R. Isaksen, J. F. Melzer, W. H. Grainger.

38,000 Cars Driven Overland

NEW YORK, May 13—How the motor car industry is co-operating in conserving transportation is shown by the fact that in the first 3 months of 1918 38,000 motor cars were driven over the roads to the dealers and distributers by eight of the larger manufacturers. This represented 33 per cent of their production. This number of drive-aways relieved the railroads to the extent of 10,000 freight cars.

Reports from different companies show that a large percentage of their cars are being driven away overland within a radius of 500 to 600 miles. During the past 60 days the Mitchell company has through its dealers driven away 33 1/3 per cent of its production, most of the cars going to Iowa, Missouri, Ohio, Kentucky, Pennsylvania, as well as the nearby States of Illinois, Indiana and Wisconsin.

Studebaker has led drive-aways to all points in the East, to as far South as the Gulf, and to several points as far West as Nebraska and to Colorado.

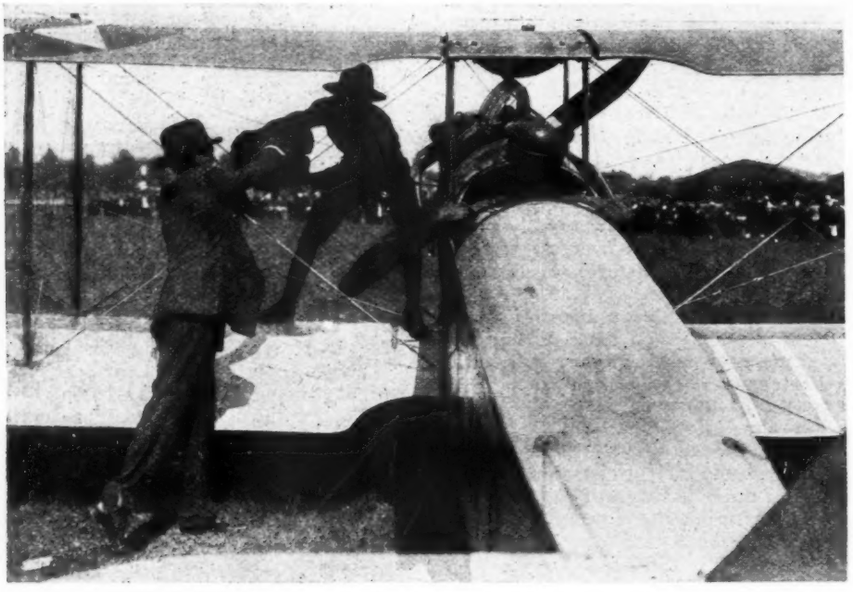
Haynes reports that 60 per cent of its output is being delivered by driving overland. One-third of the coal production is being driven away by dealers.

Favor Airplane Mail Service

WASHINGTON, May 14—The Senate went on record to-day, following some previous objections to be as approved from experiments by the Postmaster General, in airplane mail service. Efforts to defeat the appropriation for $10,000 for these experiments and for the establishment of the Alaskan air mail route were defeated by 32 to 24.

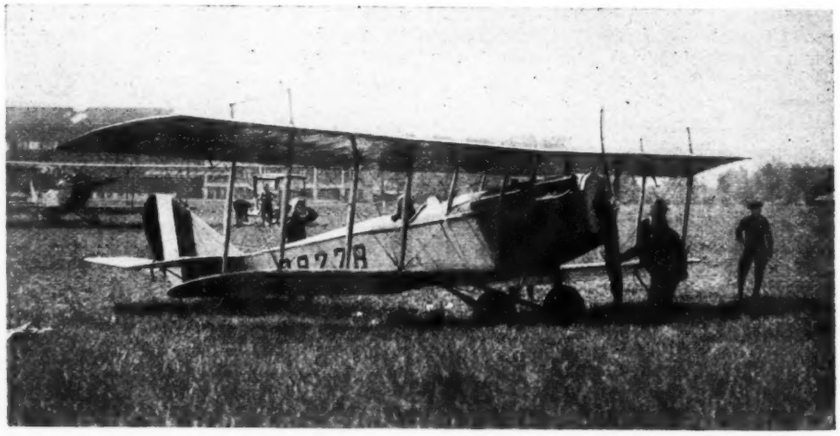
	Output of Refineries of United States				Daily Average of Output of Refineries					Stocks on Hand		
	Jan., 1918	Jan., 1917	Feb., 1918	Feb., 1917	Jan., 1918	Jan., 1917	Feb., 1918	Feb., 1917	Total, 1917	Jan. 31, 1918	Feb. 28, 1918	Dec. 31, 1917
Crude run	23,198,978	23,157,349	22,798,635	21,570,486	748,354	771,912	814,237	719,016	828,532	12,324,191	11,633,411	11,638,433
Oils purchased and re-run	2,227,432	.....	2,207,678	.....	71,853	.....	78,846	.....	40,816	752,740	714,444	973,322
Gasoline (gal.)	234,714,062	189,169,526	225,823,365	172,704,579	7,571,421	6,305,651	8,065,120	5,756,819	7,478,663	469,277,166	518,794,609	412,256,833
Kerosene (gal.)	114,926,727	120,735,586	117,108,150	113,369,304	3,707,314	4,024,519	4,182,434	3,778,910	4,389,082	436,254,045	411,150,157	497,750,082
Gas and fuel (gal.)	534,729,645	443,955,903	498,858,331	424,115,567	17,249,343	14,798,863	17,816,369	14,137,185	17,228,577	547,450,775	502,046,087	577,899,112
Lube (gal.)	54,706,360	57,954,874	56,440,455	51,831,577	1,764,721	1,931,829	2,015,721	1,727,719	1,977,109	141,907,918	150,259,653	136,855,342
Wax (lube)	37,582,833	34,084,178	33,272,888	41,439,730	1,212,349	1,132,806	1,188,217	1,117,991	1,208,515	153,807,210	148,732,948	135,059,927
Coke (ton)	41,216	37,622	42,371	35,672	1,330	1,254	1,512	1,189	1,327	8,010	9,885	7,585
Asphalt (ton)	54,845	48,860	42,033	36,795	1,769	1,628	1,501	1,326	1,891	92,209	98,695	52,860
Misc. (gal.)	70,764,468	21,089,919	74,966,339	20,013,294	2,282,725	702,998	2,677,369	667,109	1,816,849	230,886,638	229,923,515	261,363,964
Loss (gal.)	1,025,700	844,007	929,720	864,931	33,087	28,133	33,204	28,831	33,627	.....	.....	.....

The inauguration of America's first regularly-established airplane mail service was started May 15, a Curtiss model JN-48 equipped with a 150-hp. Hispano-Suiza engine leaving Belmont Park, L. I., for Washington. The trip was made in 200 minutes



One mail sack containing 144 lb. of first-class mail, at 24 cents per oz., constituted the load that went from New York to Washington

This is the type of airplane that was used; it was photographed immediately before the start from New York. This plane went as far as Philadelphia, where the mail was transferred to another



Inaugurate Airplane Mail

(*Continued from page* 966)

rail and distributed by special delivery.

When the present routes are fully developed it is the aim of the department to extend the service to other parts of the country. A route from New York to Boston is the next most likely avenue of air mail service.

All mail matter deposited in the Pennsylvania station branch of the New York Post Office before 10 A. M. was assured of transmission. Of course, such mail matter had to be marked "aero service," and the rate of postage is 24 cents per oz. Special postage stamps for this service have been designed.

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(Special Telegram)

WASHINGTON, May 15—The First airplane mail service was inaugurated here to-day when Major R. H. Fleet and Lieutenant George L. Boyle started a Curtiss JN-48 military tractor airplane toward Philadelphia and New York. Flight started at 11:45, and after circling the grounds the airplane headed directly for Philadelphia at 11:49. Thousands witnessed the flight, including President and Mrs. Wilson and Postmaster Burleson. President Wilson personally dropped the final letter into the mail bag. Two mail bags, each weighing 150 lbs. were carried.

Standardize Fordson Equipment

Henry Ford & Son Will Not Market This Directly—Will Tell Dealers What to Handle

COLUMBUS, OHIO, May 15—Henry Ford & Son, manufacturers of the Fordson tractor, will not directly market any of the power farm equipment which will be used with the company's tractor. The company, however, will dictate exactly what equipment Fordson tractor distributers shall handle.

It is important that every tractor put out shall deliver maximum performance, both as respects quantity and quality of work. It is Mr. Ford's conviction that this can be assured only when specially designed machines which shall have his personal approval are used with the Fordson. Every article of equipment built will be thoroughly tested out and only after it proves that it can meet every requirement will it receive official approval. Once that is conferred, however, that particular piece of equipment becomes standard Fordson equipment and every dealer who sells the Fordson tractor will sell that and no other.

Mr. Ford long ago requested certain manufacturers of farm operative equipment to design and build implements to be used exclusively with his tractor. This was the reason behind the development of the No. 7 Oliver engine gang plow, designed and manufactured by the Oliver Chilled Plow Works, South Bend, Ind., and the engine double disc harrow, designed and built by the Roderick Lean Mfg. Co., Mansfield, Ohio. These machines already are being distributed by Fordson agents and other machines are to come.

It is expected that within a reasonable time there will have been designed and put upon the market a complete assortment of draw bar and belt power equipment for the Fordson tractor.

In turn, it is understood that such special equipment shall be sold exclusively by the Fordson dealers. This will operate to take the Fordson equipment out of the category of general farm implements and put it in a class by itself. Thus it will be sold as a specialized product and will not affect in any way the traditional policy of implement manufacturers toward their regular sales organization.

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Steel Retarding Production

DETROIT, May 14—From all quarters it is learned that steel is holding up production to some extent, though not seriously. But this is not the only difficulty manufacturers are encountering. Shortage of labor is still being felt; transportation is insufficient to meet requirements, and a number of plants are complaining that they are not receiving all the coal they need.

The production of the Hupp, which should be 50 cars a day, is forced to stay at 40. Hudson, while supplied amply with certain kinds of steel stock, is finding it difficult to obtain certain needed parts. Dodge Brothers and Cadillac, however, are reported to be well fixed in regard to steel. Buick is experiencing some difficulties in getting certain kinds of steel. Denby needs frame steel and the Federal Truck is unable to obtain supplies of axles.

Nearly all the manufacturers in this territory are making arrangements to stock up with coal. Denby, although using coal only for heating, is building scaffolds on which to run dump carts for the purpose of storing as much fuel as possible.

The labor situation is growing more serious, and the reported shortage is now 25,000. In many cases women are employed and are meeting the emergency.

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Landon Airplane Production Head

WASHINGTON, May 14—Archer A. Landon of Buffalo was to-day appointed director of the Division of Production of the Aircraft Board which is headed by John D. Ryan. Mr. Landon is vice-president of the American Radiator Co., and was assistant chairman of the Aircraft Board under Howard E. Coffin. "It is felt," stated Mr. Ryan to-day, "that Mr. Landon's wide experience and great ability will materially advance the production of aircraft."

Until the Overman bill is passed and definite reorganization announced, there will be no further statement of Mr. Landon's new duties. At this time he would seem to be in conflict with the Equipment Division of the Signal Corps headed by W. C. Potter which is now in charge of aircraft production.

In the recent announcement placing Mr. Ryan as chairman of the Aircraft Board, it was stated that there would be a reorganization, with production under Mr. Ryan and operation under Brig. Gen. Kenly. Mr. Landon's appointment indicates that the Equipment Division of the Signal Corps will come under the Aircraft Production Board when the new organization plans are completed. Whether this means that Mr. Potter will work with Mr. Landon or will be given new duties as direct assistant to Mr. Ryan has not yet been made public.

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United to Acquire Perlman Assets

NEW YORK CITY, May 15—The United Motors Corp., which already controls the Perlman Rim Corp. through stock ownership, is to acquire the assets and properties of the company which will be made a United Motors division. Action authorizing the transfer of the assets and property was taken at a meeting of the Perlman Rim Corp. on May 13. The change presages no alteration in the conduct or productions of the company and is in line with a similar change which was made several months ago when the Hyatt Roller Bearing Co.'s assets and property were transferred to the United.

Tractor Dealers Get Plow Sales

Oliver Company Gives Ohio Agency to Automobile Agency —Others May Follow

DETROIT, May 11—The completion of the distribution of Fordson tractors, to make up the 1000 originally apportioned to Michigan, will be undertaken directly by Henry Ford & Son, and the medium employed will be the Ford agents in the state. Henry Ford & Son explain that this method has been adopted to the end that the company may become familiar with tractor merchandising.

The price on future deliveries of tractors will be $800, f.o.b. Dearborn, with the understanding that the Ford agent may add $15 to this amount to cover freight and service. This price is to continue until the full apportionment of 1000 tractors has been exhausted.

Michigan Plow Situation Uncertain

The plow situation in Michigan is uncertain. The Oliver Chilled Plow Works is making a price of $140, f.o.b. Columbus, to meet the distribution in Ohio, and has made a deal with the Bryant Tractor Co., Columbus, Ohio, which definitely takes the plow out of the hands of the implement trade in that state. No such arrangement has as yet been perfected in Michigan, although the Oliver people appear to be disinclined to continue the introductory price of $125 which was made there originally.

E. T. Bryant, Dearborn, Mich., is trying to obtain the Michigan state agency on the Oliver plow and on other implements which have been especially designed to use with the Fordson tractor. He says that a contract was made covering the agency for the special disc harrow, made by the Roderick Lean Mfg. Co., Mansfield, Ohio, and that he is negotiating with the Emerson-Brantingham Co., Rockford, Ill., for the E-B seeder. At last advices he had closed none but the Mansfield deal.

English Shipment Almost Complete

Shipment of the English order for Fordson tractors will have been completed within a few days, probably within a week, according to the company. Production at the present time is in the neighborhood of 100 tractors daily, about 70 of which are for domestic use. The states having priority are Michigan, Ohio, Iowa, Wisconsin, Kentucky, Massachusetts, Tennessee, Virginia, Nebraska and South Dakota.

As soon as the English order is completed the entire production will be apportioned among these states.

Two hundred tractors a day is the production mark set by Henry Ford & Son after June 1. Sorenson, engineer of the company, says that if nothing untoward happens there will be 50,000 Fordson tractors in the hands of farmers by Jan. 1, 1919.

Data Sheet Changes Considered

S. A. E. Division at New York Meeting Decides to Retain the Present Size

NEW YORK, May 13.—At a meeting of the Data Sheet Division of the S. A. E. Standards Committee, held in this city last Friday, the proposition of enlarging the size of the data sheets issued by the Society was again taken under advisement. After reviewing a previous decision to retain the present size of sheets, the Division came to the conclusion that the advantages of the present size considerably overbalances the advantages of the proposed larger size (the standard letter size, 8½ x 11 in.). Some of the reasons for increasing the size of the sheets are as follows:

1. Cuts could be made larger.
2. More space would be available for lengthy specifications.
3. Larger type could be used.
4. The Hand Book would not be so thick.
5. It would be possible for engineers and users of the hand book to file letter-size drawings, etc., with the data sheets.

Following are some reasons against a change in the size of the data sheets.

1. Practically all cuts can be printed in the sufficient size on the present size sheets.
2. There is no objection to printing lengthy specifications on two or more pages. Comparatively few tabulated specifications require more than one page, but where they do, two pages facing each other can be used. This is in accordance with present practice.
3. A satisfactory type size for both text and tabulated specifications is now being used.
4. The greatest possible thickness of the present hand book is not objectionable.
5. Hand-books are not intended for filing miscellaneous sheets.
6. Considerable objection has been voiced by users to the larger size, as it would take up too much desk or table room.
7. The considerable expense to the Society and the inconvenience to members in making a change is objectionable.

It was said that after the war there probably would be a good deal of new data available and that if any change were to be made at all, it should be made later. The question of larger sheets should be referred to members of the Society at large, to get a consensus of opinion and then referred to the Council. The Division, therefore, confirmed its recommendation of Sept. 28, 1917, to retain the present size, 4¾ x 7¼ in.

A recommendation was made that sheets 25 b, c and d, Vol. 1, which contain data regarding operating costs of gasoline trucks, should be replaced with sheets of more recent data. It was further recommended that the title of data sheet 4 b, Vol. 1, be changed from Dimensions and Strength of Standard Bolts, Screws and Nuts to Dimensions and Strength of S. A. E. Standard Bolts, Screws and Nuts.

The view was expressed that sheets 6, 6 e, and 6 f, Vol. 1, contained obsolete matter, and it was recommended that these be replaced by revised sheets giving data relating to U. S. Standard and A. S. M. E. standard bolts, screws and nuts.

After considerable discussion, and a review of the sectional index presented some time ago, the Division recommended that this be brought up to date, and that a new section be added, entitled "Special Equipment and Fitting Section," with subdivisions headed Aeronautic, Automobile, Motor-cycle and Tractor.

As the type of shaft key commonly known as the Woodruff key has been incorporated in some of the S. A. E. standard specifications, it was thought desirable to have a list of these in the handbook. A set of the Whitney Company's data sheets showing these keys was obtained, and they were rearranged by the S. A. E. office in a form suitable for inclusion in the hand book.

A number of curves submitted to the Standards Committee were reviewed, and some of them selected for inclusion in Vol. 2.

The next meeting of the Division will be held at the S. A. E. office, Tuesday, June 4, at 1:30 p. m.

Hercules Again Styled

MILWAUKEE, May 13—The Stegeman Motor Truck Co. has changed the style of its 6-cylinder truck from Hercules back to the original name, Stegeman.

Have Twenty-Nine Flying Fields

Are Named After Men Lost in Aviation Activities—Names and Locations

WASHINGTON, May 14—The army air service now has twenty-nine flying fields. Fourteen of these were announced last fall. The remaining fifteen have been established since.

Most of the schools are regular service fields where the graduates of the ground schools receive their flying instructions and some are reserved for advance flying, experimental testing, special training in bombing, artillery observation, etc. With the exception of McCook Field, named after the Fighting McCooks, and three fields named after pioneers in aeronautics, Langley, Chanute and Wilbur Wright, the remainder are named after American men and officers who have lost their lives in aeronautical duty.

Of those named below, the Payne, Souther, March and Mather Fields are not yet opened, but will soon be ready for flying instruction.

The fifteen fields added since last fall are:

Brooks Field, San Antonio, Texas; named after Cadet Private S. J. Brooks. Carlstrom Field, Arcadia, Florida; named after Victor Carlstrom. Barron Field, Everman, Texas; named after Cadet R. J. Barron. Carruthers Field, Benbrook, Texas; named after Cadet W. K. Carruthers. Chanute Field, Rantoul, Illinois; named after Octave Chanute. Dorr Field, Arcadia, Florida; named after Cadet S. H. Dorr. Eberts Field, Lonowa, Arkansas; named after Lieut. M. M. Eberts. Langley Field, Hampton, Va.; named after Samuel Pierpont Langley. McCook Field, Dayton, Ohio. Mather Field, Sacramento, California; named after 2nd Lieut. C. S. Mather. March Field, Riverside, California; named after 2nd Lieut. P. C. March, Jr. Payne Field, West Point, Miss.; named after Capt. DeWitt J. Payne. Souther Field, Americus, Georgia; named after Henry Souther. Taylor Field, Montgomery, Ala.; named after Capt. Ralph L. Taylor. Wilbur Wright Field, Dayton, Ohio; named after Wilbur Wright.

The first fourteen fields established follow:

Call Field, Witchita Falls, Texas; named after 1st Lieut. L. H. Call. Chandler Field, Essington, Pa.; named after 2nd Lieut. Rex Chandler. Eilington Field, Houston, Texas;

The Lawson airplane, model M. T. 2, built for advanced training or reconnaissance work. It is equipped with a Hall-Scott 4-cylinder A.7A. engine, and made its first flight May 2

named after 2nd Lieut. E. L. Ellington. Gerstner Field, Lake Charles, La.; named after 2nd Lieut. F. G. Gerstner. Hazelhurst Field, Mineola, L. I.; named after 2nd Lieut. L. W. Hazelhurst, Jr. Kelly Field, San Antonio, Texas; named after 2nd Lieut. G. E. M. Kelly. Love Field, Dallas, Texas; named after 1st Lieut. M. L. Love. Park Field, Millington, Tenn.; named after 1st Lieut. Joseph D. Park. Post Field, Fort Sill, Okla.; named after 2nd Lieut. H. B. Post. Rockwell Field, San Diego, Cal.; named after 2nd Lieut. L. G. Rockwell. Selfridge Field, Mt. Clemens, Mich.; named after 1st Lieut. Thomas Selfridge. Taliaferro Field, Fort Worth, Texas; named after 1st Lieut. Walter R. Taliaferro.

To Build Caproni in U. S. A.

WASHINGTON, May 14 — Contracts will be placed shortly for a large quantity of Caproni biplanes to be manufactured in this country. Caproni machines will be used for night bombing and will be equipped with Liberty engines. It is believed that the Italian Aircraft Mission en route to this country is bringing plans of the latest Caproni models.

The adoption of the Caproni as the night bombing airplane and of the de Haviland IV for the day bombing machine leaves one type of machine yet to be selected, the scout and combat plane. It is anticipated that the Bristol will be used for this purpose if it is found satisfactory after the modifications are made in it.

$907,338,000 Spent on Aircraft

Signal Corps Report Shows $563,838,000 for Airplanes and Engines

WASHINGTON, May 10—A statement from the Signal Corps was presented to-day to the Senate showing all aviation expenditures. Total appropriations were $749,886,000 and excess contract authorizations and expenditures amount to $157,453,000. Engines, airplanes, parts, etc., amount to $229,000,000 under the fixed price contract and $334,000,000 under the cost-plus plan. Construction work came to $53,000,000 under the fixed contract; balloon division $16,000,000 under fixed contract; schools, experiments, etc., $850,000; pay and expenses $14,000,000, and sea coast and equipment, including insular possessions, $40,000,000.

The total reported of contracts made was $556,478,000 under the fixed price system and $350,860,000 under the cost-plus-profit plan. The itemized statement is given in the table below:

Good Airplane Publicity

CHICAGO, May 15—An example of the good publicity which should have been given the Liberty engine and the airplane program in general took place last Friday when F. E. Moskovics, vice-president of Nordyke & Marmon Co., gave a talk before 1500 members of the Chicago Association of Commerce on the Liberty engine. While Mr. Moskovics gave little that was new, he presented to this organization of business men facts that they should have known months ago and which have been published in AUTOMOTIVE INDUSTRIES during the last six months. It was just the kind of talk businessmen from all industries should receive and if a hundred other such talks had been given throughout the country the present critics of the Liberty engine and our airplane program in general would not have been able to get away with the criticisms and malicious attacks that they have been able to put over due to the general ignorance of Congress and our people on airplane programs.

Mr. Moskovics told of overestimating our capacity to build engines in July, 1917, when the present plan was laid out. He quoted from H. M. Crane, chief

Line	Appropriation and Allotment	Amount of Appropriation or Allotment	Orders and Authorities: Fixed Price	Orders and Authorities: Cost Plus	Balance	Cash Disbursements: Reported	Cash Disbursements: Unreported	Cash Disbursements: Total
1.	Increase for aviation, Signal Corps, 1918: Equipment division, including airplanes, engines, and their spare parts; transport, general equipment; special clothing; ordnance and ammunition	$518,618,440.00	$227,374,964.55	.....	$36,636,403.21	$162,079,796.94	.....	$162,079,796.94
	Acquisition of plants	6,000,000.00	2,520,599.83	.....	3,479,400.17	1,036,952.54	.....	1,036,952.54
	Total	$524,518,440.00	$229,895,564.38	$334,838,679.00	$40,115,803.38	$163,116,749.48	.....	$163,116,749.48
2.	Construction division, including the purchase and lease of land, and the construction of buildings at home and abroad for schools, flying fields, storehouses, etc., Total	$41,456,400.00	$53,441,457.43	.....	$11,985,147.43	$42,268,203.32	.....	$42,268,203.32
3.	Balloon division, including balloons, their accessories, balloon buildings, transport, gas, etc., Total	27,119,550.00	16,302,042.91	.....	10,817,507.09	7,674,721.16	.....	7,674,721.16
4.	Schools division (maintenance), Total	1,056,000.00	850,013.01	.....	205,986.99	293,919.11	.....	293,919.11
5.	Finance division, including pay and expenses, Reserve Corps, students, civilian employees, experimental investigations, departments and depots, expenses of Aircraft Board, etc., Total	45,749,610.00	14,691,488.56	.....	31,058,121.44	6,956,343.18	.....	6,956,343.18
6.	**Total I. A. S. C., 1918**	$640,000,000.00	$315,180,656.29	$334,838,679.00	$10,019,335.28	.....	$31,175,798.61[8]	31,175,798.61
7.	Materials and Sales Section[1] Obligations	.....	154,031,840.57	16,021,500.00	$170,053,340.57	7,705,769.21	.....	7,705,769.21
8.	Total disbursements I. A. S. C., 1918[2]	.....	.....	.....	.....	$228,015,705.46	$31,175,798.61	$259,191,504.07
9.	Other aeronautical appropriations and allotments, including aviation seacoast defenses at home, Hawaii, Philippines and Panama, made prior to July 24, 1917, total[3 4 5]	51,955,272.14	39,767,298.50	.....	$12,187,973.64	[6]56,663,185.96	.....	[6]56,663,185.96
	Total, all aeronautical appropriations and allotments	$691,955,272.14	$508,979,795.36	$350,860,179.00	$167,884,702.22	$284,678,891.43	$31,175,798.61	$315,854,690.03
10.	Signal Service appropriations and allotments:[4 5] Total Signal Service appropriations and allotments	57,487,508.94	47,238,957.70	.....	10,248,551.24	[7] 857,988.61	.....	[7] 857,988.61
11.	Appropriations for replacements, Total	443,271.60	260,216.22	.....	183,055.38	194,862.28	.....	194,862.28
12.	Grand Total	$749,886,052.68	$556,478,969.28	$350,860,179.00	$157,453,095.60	$285,342,017.75	$31,175,798.61[8]	$316,517,816.36

[1] The Materials and Sales Section—Obligations include orders and authorities for equipment and instruments purchased by the "Signal Corps for resale to contractors, Navy Department and foreign governments." A small portion of this amount, to be later determined, will be an obligation of the appropriation, "I.A.S.C., 1918."
[2] Cash disbursements against materials and sales. Obligations are included under the total withdrawals of I.A.S.C. appropriations.
[3] This is an allotment given the "Signal Corps" by the "Navy Department."
[4] The total of these two items comprises one appropriation, "Signal Service of the Army, 1917-18, act June 15, 1917."
[5] The total of these two items comprises one appropriation, "Signal Service of the Army, 1918."
[6] Includes withdrawals from Treasury for Signal Service part of the appropriation.
[7] Withdrawals from Treasury for Signal Service part of the appropriation included in withdrawals under aeronautical appropriations.
[8] Unreported cash disbursements consist of cash in the hands of disbursing officers, United States Army.

Approved May 8, 1918. S. E. WOLFF, Major, Signal Corps, In Charge Finance Department.

BRIGADIER-GENERAL WILLIAM F. KENLY, who is in charge of all aviation training for the United States Army, was born Feb. 18, 1864. He was graduated from West Point as a cadet in 1885 and from the Artillery School as a First Lieutenant in 1894. In 1907 he was promoted Major and in 1917 a Lieutenant-Colonel. In 1917 he was promoted a Colonel and went to France with General Pershing and the American Expeditionary Force. While in France he was promoted to Brigadier-General and about 60 days ago returned to the United States.

engineer of the Wright-Martin Aircraft Corp., who told of the unexpected difficulties of an American factory taking up the production of a European design of engine. It was the information that Mr. Crane gave before the January S. A. E. meetings, but it had never reached this group of men, representing hundreds of industries, before.

The talk was just the kind needed for businessmen not connected with the airplane industry, the automobile industry or other allied industries. It conveyed to these men the inside facts known to the automotive industries. The meeting was a good example of that necessary publicity which should have been going on for many months throughout the country to counteract the insidious German propaganda and propaganda of certain manufacturers who have been opposed to the Liberty engine for business reasons.

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Changes in Timken-Detroit Personnel

DETROIT, May 15—Many changes have taken place in the organization of the Timken-Detroit Axle Co. due to the resignation of Eugene W. Lewis as vice-president and director. Mr. Lewis, who has entered government service, is succeeded by A. R. Demory as vice-president and general manager. F. W. Gilbert, secretary, becomes vice-president in charge of sales and advertising, and C. W. Dickerson, treasurer, becomes secretary in addition to his regular duties.

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Gray & Davis Increases Capital

BOSTON, May 16—Gray & Davis, Inc., has issued 4452 shares of new common stock, par value $25, thereby increasing its capital stock $11,300.

New York Passes Lamp Law

Statute Provides That State May Test Anti-Glare Devices That Are Submitted to It

ALBANY, May 13—Makers and sellers of lenses and other anti-glare devices may now learn definitely from the state whether their devices are within the headlight regulations. The provision is Subdivision 6 of the recently passed amendment to the highway law, relating to lights on motor vehicles.

The law provides that lamps shall not exceed 24-candlepower, that rays shall not rise above 42 in. at 75 ft., that the illumination shall fall 10 ft. to the sides at 10 ft. ahead, that the light shall be visible 250 ft. ahead and in unlighted streets and on country roads the lamps shall make objects visible at 250 ft. On trucks of 2 tons and over, so governed as not to exceed 15 m.p.h., the lamps shall be visible 200 ft. and shall illuminate unlighted roads for 150 ft. Taillights shall make the license number legible at 50 ft.

The testing subdivision follows:

> Any person may submit to the secretary of state a device for controlling the front lights of motor vehicles so that they shall comply with the provisions of this section while the vehicle is proceeding, together with an application that such device be tested as prescribed by this section. Such applicant shall pay to the secretary of state a fee of fifty dollars. Thereupon the secretary of state may submit such device to a qualified technical expert or experts from the physical laboratory of a university or technical school within the state of New York, under the jurisdiction of the university of the state of New York, with a request that it be tested as to its compliance with the provisions of this section. Upon notice from such technical expert or experts that such test has been made and that such device complies with the provisions of this section, the secretary of state may issue a certificate to the applicant describing the device and certifying that such test has been made and that the device complies with the provisions of this section. The expense of such test by such technical expert or experts shall be paid from the fee collected from the applicants, and the balance of such fee, if any, shall be paid into the state treasury.

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29 Miles on K. B. C. Carbureter

CHICAGO, May 14—Twenty-one and a half miles on a gallon of gasoline and 29.05 miles on kerosene was the result obtained by a Ford car fitted with a K. B. C. carbureter in a test by the Chicago Automobile Club under sanction of the A. A. A. The car used was strictly a stock car during the gasoline tests, but used a Hot-Pin manifold in connection with the kerosene carbureter. Two Ford cylinder-head gaskets and a 3.32 in. steel gasket were used under the head when the kerosene tests were made, to lower the compression from 60 to about 53 lbs.

In the test for mileage on gasoline, one full stop was made owing to traffic, the carbureter bowl finally running dry at 21.5. In tests for acceleration there was a difference of only 3.5 sec. in favor of gasoline. The trials were made from 5 to 30 m.p.h. In high gear the lowest car speed was about 6 m.p.h. for both gasoline and kerosene. In climbing the north end of Hubbard's hill, the K. B. C. carbureter showed a slight advantage over the stock Ford gasoline equipment, the time for the former being 33 sec. as compared with 34 for gasoline. On the south hill a slightly better performance was obtained on gasoline, but this was due mainly to ignition trouble which developed while the kerosene was being tested.

After the kerosene tests the engine head was removed, revealing practically a clean set of pistons, valves and plugs. The latter, especially, were in excellent shape. The kerosene carbureter was a stock model of the K. B. C. Carbureter Co., Detroit. The tests were in charge of E. A. Turner.

ARCHER A. LANDON, vice-president of the American Radiator Co., who has just been appointed head of the Production Division of the Aircraft Production Board, has been well known in the manufacturing world for many years. More than 20 years ago he joined the American Radiator Co. as a machinist, and after a few years was appointed manager of one of the smaller plants. Later he was promoted manager of one of the company's larger plants. Further promotions made him, in turn, assistant general superintendent of plants, and finally general superintendent of plants. Three years ago Mr. Landon was elected vice-president of the company in charge of production.

In addition to his work with the American Radiator Co., he has been active in public life. He is president of the Buffalo Chamber of Commerce, and although not definitely connected with any labor organization, has taken an interest in labor problems from the labor welfare standpoint. Mr. Landon is about 50 years old.

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Three More States Order Fordson Tractors

DETROIT, May 15—Three more states have ordered Fordson tractors. North and South Dakota will take 500 each and Minnesota has ordered 1000. One hundred of the tractors are going to Uruguay and an additional hundred to Haiti.

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Columbia Truck Chassis Advanced

DETROIT, May 15—On June 1 the price of the Columbia 2-ton motor truck chassis will be increased to $2,275, an advance of $285. The present price is $1,990.

Urge Rural Express Routes

Highways Transport Committee Actively Engaged in Assisting in Their Development

WASHINGTON, May 15—The Highways Transport Committee of the Council of National Defense has outlined a plan for concerted action to facilitate the establishment of Rural Express Routes in practically every state in the union. Since conditions under which such routes would have to be formed differ in all states, because of geographical conditions, etc., it is proposed to carry on the work through the various State Councils of Defense and ultimately through similar public and semi-public organizations in the large cities.

Organization Started

A start in the organization of such routes already has been made in the vicinity of Washington. There are twenty-two Rural Express Routes now operating in Maryland; fifteen operate out of Baltimore; five out of Washington, and one out of Cumberland. Thirty trucks, having a combined capacity of 73½ tons, cover 1574 miles daily on these routes. They afford a possible daily service of 115,690 ton-miles or 35,000,000 ton-miles a year. They can haul more than 100,000 tons of farm produce into Baltimore and Washington every day and carry an equal amount of merchandise back to the farmers and country merchants.

The shortest route is 10 miles from Baltimore to Ellicott city, and the longest is 47 miles from Baltimore to Frederick. Recently, daily service has been started between Philadelphia, Baltimore and Washington by a trucking company that has had a fleet of trucks in operation between New York and Philadelphia—104 miles—since last September.

All Goods Handled

Every kind of produce raised on farms, all sorts of goods raised by farmers, and various products of factories are handled by the trucks. The list includes vegetables, fruit, corn, wheat, milk, butter, eggs, chickens, live calves, cows and pigs, fertilizer, wood, coal, farm machinery and repair parts, groceries, drugs, clothing, shoes, hardware, house furnishings, fixtures, musical instruments, jewelry and newspapers. The market price of produce in Baltimore at present averages 20 per cent lower than in Washington and this is ascribed to the Rural Express Routes which feed Baltimore from outlying agricultural areas.

The Council of National Defense is suggesting that local councils prepare maps showing improved roads within a radius of 50 miles or so of population centers which are surrounded by agricultural areas from which food may be brought. With these maps in hand, the next step is to ascertain where it would be advantageous to establish routes, after which it is suggested that negotiations be carried on with farmers along such routes with a view to interesting them in the use of existing trucks for carrying their own produce to market and that of other farmers along the route.

The Highways Transport Committee has sent out a questionnaire to farmers in the vicinity of Washington along these lines and has received very encouraging replies. These replies will be used as a basis in assisting in the organization of additional routes between Washington and nearby farming centers.

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Rubber Plant Resumes Work

FINDLAY, May 14—The Giant Tire & Rubber Co., which was destroyed by fire recently, has resumed operations in part of the buildings of the Faultless Anchor Co. until the plant can be reconstructed.

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Olympian Motors in Production

PONTIAC, MICH., May 14—The Olympian Motors Co. shipped its first car 2 weeks ago. Production is now 10 cars a day, and this is expected to be increased to 15 daily within a week.

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Detroit S. A. E. to Elect Officers

DETROIT, May 14—At a meeting of the Detroit Section of the Society of Automotive Engineers to be held Friday, May 24, at the Hotel Pontchartrain, Lee Anderson, vice-president of the Hupp Motor Car Co., will give a talk on "Sales Problems of the Immediate Future."

The annual election of officers will also take place at this meeting. The nominees follow:

Section chairman, J. Edward Schipper, Detroit technical editor, The Class Journal Co.; vice-chairman, A. C. Hamilton, chief engineer of the Oakland Motor Car Co., Pontiac; treasurer, Don T. Hastings, chief engineer of the Holley Kerosene Carbureter Co.; secretary, C. F. Van Sicklen, secretary of the Van Sicklen Speedometer Corp.; Member of the National Nominating Committee, R. E. Wells, chief engineer of the Hyatt Roller Bearing Co.

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United States To Make 500 B Trucks

CINCINNATI, May 14—The United States Motor Truck Co. has received another government contract for 500 more Class B standard trucks. The contract amounts to approximately $350,000.

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Toledo Cartage Men Organize

TOLEDO, May 14—Cartage men of this city have formed the Toledo Cartage Men's Assn. The purpose of the association is better co-operation among members in handling not only long-distance freight questions, but all matters pertaining to the cartage business in Toledo.

The officers of the association are: President, James Manon; vice-president, W. C. Rathbun; secretary, C. M. Harrison; assistant secretary, James O. Fowler; treasurer, C. Gernheiser.

M. & A. M. A. Credit Men to Meet

Expected That 125 Will Attend Atlantic City Convention, May 20 and 21

NEW YORK, May 15—It is expected that more than 125 persons will attend the second annual convention of credit managers of the Motor and Accessory Manufacturers' Association, which is to be held at the Hotel Traymore, Atlantic City, on Monday, May 20, and Tuesday, May 21. The first annual convention was held in Cleveland on Oct. 18 and 19 last year. The first session of the convention is to be brought to a close with a War Conservation Dinner at 8 p.m. Monday. Following is the complete program:

Monday, May 20.

Opening Address.....	Charles W. Stiger, President; President Stromberg Motor Devices Co., Chicago.
Fighting Hopefully....	E. J. Cattell, City Statistician, Philadelphia.
The Credit Department of the M. & A. M. A. and What It Hopes to Be.....	C. A. Burrell, Credit Manager.
The Credit Man's Interest in Trade Conditions Today.....	R. M. McConnell, Asst. Cashier Nat. Bank of Commerce, Detroit.
War Conservation Dinner	8 P.M.

Tuesday, May 21.

A Day With the Bank Credit Man	F. B. Snyder, vice-president First Nat. Bank, Philadelphia.
Trade Acceptances—The Banker's Viewpoint	Wm. F. H Koelsch, President, New Netherland Bank, N. Y.
Trade Acceptances—The Buyers' Viewpoint	E. F. DuBrul, President, Miller, DuBrul & Peters Mfg. Co., Cincinnati.
How Some Present Conditions Are and May Be Expected to Affect the Automobile Industry.....	David Beecroft, Directing Editor, Class Journal Co.
The Vital Importance of Military Aeronautics — Recent Developments in Europe...	Augustus Post, Foreign Delegate Aero Club of America to England and France.

E. S. Foljambe, of the Chilton Co., will talk Monday afternoon at 2 o'clock on "The importance of accessory and parts manufacturers entering the tractor field with a standardized product as an after-the-war measure."

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New Company Allied With F. B. Stearns

CLEVELAND, May 15—F. B. Stearns, chairman of the board of directors of the F. B. Stearns Co., is president and treasurer of the Stearns Aero Parts Co., recently organized in this city. It is stated that the new company is closely related to the F. B. Stearns Co., and its organization resulted from the desire of the latter to do experimental work.

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Reilly Made Globe Sales Manager

NEW YORK, May 16—W. P. H. Reilly has been promoted to the position of general sales manager of the Globe Rubber Tire Mfg. Co. He has been special representative of the company since last January. Previous to that he was Pacific Coast sales manager of the Ajax Rubber Co.

Class A and AA Trucks Not to Be Discontinued

WASHINGTON, May 13—Despite the many rumors and predictions that the Class A and AA standardized war trucks are to be shelved, it now appears likely that they will be a part of the military program as originally planned. It is definitely known that certain officials favoring standardization of trucks have influenced Secretary of War Baker, who is an exponent of standardization, to look into the truck program.

As told in these columns, there has been severe criticism of the standardized truck program and strong opposition on the part of certain manufacturers. The transfer of General Chauncey B. Baker, who originally headed the standardized truck program, and the long delay in placing contracts for the A and AA trucks, samples of which were finished several months ago, have created the belief that the standardized program, insofar as the smaller trucks were concerned, was cancelled.

It is known that Secretary Baker favors the standardized truck program. Now that he has been interested in the present controversy, it may be assumed that he will throw his influence on the side of standardization.

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Government Tests for Gasoline Substitute

WASHINGTON, May 10—Government tests of a new substitute for gasoline will be made next week at Pittsburgh. The inventor, Dr. Louis Klement, says that this can be made for 8 cents a gallon. A quantity of the new combustible was prepared at the Department of Interior laboratories here and shipped yesterday to the Government's Pennsylvania experimental station. Government officials here say the preparation will cost more than gasoline.

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U. S. Light Buys $105,000 Bonds

NIAGARA FALLS, N. Y., May 13—Final computation shows that the U. S. Light and Heat Corp. bought third Liberty loan bonds to the extent of $105,000, of which $55,000 worth was taken by employees. The purchase on the second loan was $102,000, of which $52,000 was taken by employees. On the first loan bonds employees bought $22,000 worth. This makes a total of $229,000 worth of bonds that the corporation has taken of the three issues.

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Commercial Economy Board Transferred

WASHINGTON, May 14—The Commercial Economy Board, of which A. W. Shaw is chairman, has been transferred from the Council of National Defense to the War Industries Board. It will continue its present work of creating conservation plans for various industries and trades, but will henceforth be styled the Conservation Division of the War Industries Board.

This is one of the last important bodies to leave the Council of National Defense, and marks the passing of that organization which, it is expected, will be completely abolished after the passing of the Overman bill.

The new Conservation Division plans to create new methods for conserving labor and materials in other trades than the clothing, shoe, paint, agricultural implement and garment industries, which have already been aided in solving the various trade problems.

Arrange Export Schedule of Commodities for Norway

WASHINGTON, May 14—The War Trade Board, through its general commercial agreement with Norway for the export of United States goods, has created a schedule of the commodities and the quantities which Norway is entitled to import per year.

In some cases the quantities of the commodities scheduled for Norway have not been fixed, but are subject to a future arrangement.

These include the following:

Commodity	Quantity
Mineral Oils	76,500 tons
Shellac	68 metric tons
Rubber	500 metric tons
Rubber covers for automobiles and trucks	17,000
Rubber tubes for automobiles and trucks, including importations on cars	8,300
Solid rubber tires, including importations on cars and trucks.	1,100
Rubber tubes for motorcycles, including importations on motorcycles	2,100
Motor cars, trucks, tools, chemicals, agricultural implements, etc.	As required by Norway
Antimony	12 metric tons
Electrode carbon and carbon electrodes	5,000 metric tons
Tin raw	80 metric tons with increase subject to future agreement
Tin Plates	To be arranged
Lead	1,000 metric tons
Iron and steel, including pig-iron ingots, bars, hoops, angles, plates, pipes, fittings, wire, etc.	250,000 metric tons
Copper plates, bars, wire, cable	7,000 metric tons

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	54	64	+6
*J. I. Case T. M. Co. pfd.	84½	87½	+ ½
Chalmers Motor Co. com.	6	8	..
Chalmers Motor Co. pfd.	30	40	..
*Chandler Motor Co.	80	82	+2
Chevrolet Motor Co.	118	120	—3
*Fisher Body Corp. com.	32	35	..
*Fisher Body Corp. pfd.	81	87	..
Fisk Rubber Co. com.	49	52	—2
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	70	75	..
Firestone Tire & Rubber Co. com.	93	95	—1
Firestone Tire & Rubber Co. pfd.	93½	95	—1
*General Motors Co. com.	120	120¾	+3¾
*General Motors Co. pfd.	79¾	80	+ ½
*B. F. Goodrich Co. com.	44	45	+ ½
*B. F. Goodrich Co. pfd.	96	100	..
Goodyear Tire & Rubber Co. com.	143	146	—3
Goodyear Tire & Rubber Co. pfd.	96	98	..
Grant Motor Car Corp.	2¾	3½	— ¾
Hupp Motor Car Corp. com.	2¾	3¼	— ¼
Hupp Motor Car Corp. pfd.	79	85	..
International Motor Co. com.	23	28	+3
International Motor Co. 1st pfd.	55	58	..
International Motor Co. 2nd pfd.	27	32	+4
*Kelly-Springfield Tire Co. com.	44¾	45¾	+2¾
*Kelly-Springfield Tire Co. 1st pfd.	75	85	..
*Lee Rubber & Tire Corp.	14	15	..
*Maxwell Motor Co., Inc., com.	25	27	+1
*Maxwell Motor Co., Inc., 1st pfd.	53	55	+1
*Maxwell Motor Co., Inc., 2nd pfd.	23	24	+3
Miller Rubber Co. com.	103	105	..
Miller Rubber Co. pfd.	94	97	..
Packard Motor Car Co com.	96	105	..
Packard Motor Car Co. pfd.	89	92	..
Paige-Detroit Motor Car Co.	16	18	..
Peerless Truck & Motor Corp.	14	17	+3
Portage Rubber Co. com.	106	108	—1
Reo Motor Car Co.	14½	16	..
*Saxon Motor Car Corp.	6	8	—1

	Bid	Asked	Net Ch'ge
Standard Motor Construction Co.	12	14	..
Standard Parts Co.	68	70	..
*Stewart-Warner Speed. Corp.	60	61	+3
*Studebaker Corp. com.	36½	37	..
*Studebaker Corp. pfd.	75	80	—20
Swinehart Tire & Rubber Co.	26	30	..
United Motors Corp.	23½	24	— ½
*U. S. Rubber Co. com.	57	58	+1
*U. S. Rubber Co. pfd.	103	104½	..
*White Motor Co.	39½	40	—2
*Willys-Overland Co. com.	16½	17½	— ½
*Willys-Overland Co. pfd.	79	82	..

*At close. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	7½	..
Bower Roller Bearing Co.	17⅜	18½	+ ⅛
Chevrolet Motor Co.	118	120	—2
Commerce Motor Car Co.	9⅝	10¾	..
Continental Motor Car Co. com.	5⅜	5¾	..
Continental Motor Co. pfd.	..	..	..
Edmunds & Jones com.	14	17	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	173	181½	—2
Hall Lamp Co.	..	..	..
Michigan Stamping Co. com.	13¾	14¼	+ ⅛
Motor Products	..	..	..
Packard Motor Car Co. com.	106	..	+11
Packard Motor Car Co. pfd.	..	..	..
Paige-Detroit Motor Car Co.	16¾	..	— ½
Prudden Wheel Co.	11¾	..	..
Reo Motor Car Co.	14¾	15⅛	..

INACTIVE STOCKS

Atlas Drop Forge	..	26	..
Kelsey Wheel Co.	90	92	..

Men of the Industry

Changes in Personnel and Position

Clough to Head Mason Solid Tire Department

Lee Clough has been appointed head of the solid tire department of the Mason Tire & Rubber Co., Kent, Ohio. He was formerly associated in a similar capacity with the Firestone Tire & Rubber Co.

—

D. Y. Husselman, office manager of the New York branch of the Kelly-Springfield Tire Co., has been made manager of the sales promotion department. He was connected with the New York branch for 5 years and previous to that was associated with the Goodyear Tire & Rubber Co.

—

A. W. Sidell, for the last 3½ years European representative of the Gisholt Machine Co., Madison, Wis., has returned to Madison. He will be stationed at the factory for the present.

—

L. V. Spencer, formerly Detroit representative of the Class Journal Co., has joined the experimental station of the airplane department at Dayton, and will have charge of all technical engineering information coming from the station.

—

Louis N. Gay, for 12 years head of the Consolidated Auto Top Co., Cleveland, has become associated with the William R. Johnston Mfg. Co., Chicago, as manufacturers' adviser on the construction and design of tops.

—

D. C. Gould, formerly assistant district manager for the Willard Storage Battery Co. at Chicago, has been promoted to the position of district manager, with headquarters at 25 West Eleventh Street, Indianapolis. He will succeed E. B. Reeser, who has been appointed district sales engineer at Indianapolis.

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Charles S. Pike, formerly sales promotion manager of the Paige-Detroit Motor Car Co., Detroit, has been appointed truck sales manager of that company. He has been succeeded as Washington Paige representative by Frank Caulk, formerly with the Aluminum Castings Co., Detroit.

—

E. C. Baynes, formerly with the Hubbard Spring Mfg. Co., Pontiac, Mich., has been placed in charge of the Detroit sales office of the Parker Mfg. Co., Ann Arbor, Mich.

—

Arthur C. Leverton, formerly vice-president of the H. L. & W. Sales & Mfg. Co., Detroit, has been appointed factory manager of the Federal Motor Truck Co., Detroit.

—

C. A. Erickson, formerly chief engineer for the Scripps-Booth Corp., Detroit, has been made general manager of the Standard Radiator Co., Springville, N. Y.

—

A. H. McIntyre, for the last few years head of the wholesale department of the Saxon Motor Car Co. for New England, has been appointed to a similar position by the Paige-Detroit Motor Car Co. His headquarters will be in Boston.

—

R. Scott Smith, formerly district manager of the Federal Motor Truck Co., Detroit, has joined the Standard Motor Truck Co., Detroit, as district representative.

—

B. C. Wilson has joined the advertising department of the Miller Rubber Co., Akron. He was formerly connected with the Associated Press in Detroit and the Martin V. Kelley Co., Toledo.

—

J. M. Riordan has resigned as sales engineer of the Grant Lees Gear Co., Cleveland, to become associated with the sales organization of the Cleveland Milling Machine Co.

—

H. W. English, Spokane, Wash., has been made district sales manager of the Columbia Motor Truck & Trailer Co., Pontiac, Mich., for the Pacific Northwest. For the last few years he has been associated with the Republic Motor Truck Co. in the same territory.

—

E. H. Habersham, Baltimore, has been appointed district sales manager for the Columbia Motor Truck & Trailer Co. for the Southern States east of the Mississippi River. A. H. Pearsall has been made district sales manager for Illinois, with headquarters at Chicago. He was formerly branch manager of the Studebaker Corp. at Chicago.

—

J. D. Ertel, formerly office manager of the Minneapolis branch of the Kelly-Springfield Tire Co., has been appointed office manager of the New York branch.

—

C. P. Henderson, general sales manager of the Cole Motor Car Co., Indianapolis, has resigned, and on June 30 will become representative of the company on the Pacific Coast.

—

N. W. Barton, who was manager of the Chicago branch of the Olds Motor Works, Lansing, has been transferred to the factory as Eastern division sales manager.

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A. A. Gloetzner, former sales manager for the Covert Gear Co., Detroit, is reported to be somewhere in France as an engineer with the United States forces.

New Companies Formed

Latest Additions to Ranks of Automotive Industries

Pittsburgh Company to Make Steel Truck Wheels

PITTSBURGH, PA., May 14—The Pittsburgh Truck Wheel Corp. has been organized here to manufacture steel truck wheels under the Frommann patents. A site of 20-acres will be purchased for a factory, and the plant will be started on a small scale and enlarged later. The company will make wheels for motor trucks, trailers, tractors, electric express and baggage trucks and later railway cars. A. L. Schulz, Pittsburgh mining engineer, heads the new company, and Robert L. Barbour, formerly with the Pittsburgh Chamber of Commerce, is secretary and treasurer.

The organization is capitalized at $4,000,000 and has applied for a Delaware charter.

—

Plan to Destroy Stolen Car Market

DETROIT, May 13—The Automobile Abstract & Title Co. has been organized here to conduct an abstract business similar to that employed in clearing titles to real estate. The aim of the company is to stop the theft of cars by removing from the thief his market for stolen automobiles. The company, which is capitalized at $1,000,000, will maintain a home office in this city and conduct its business through agents in larger city centers.

Under its plan the man who first buys the car will pay a small fee, for which he receives an abstract showing a clear title, the firm retaining a duplicate. When the car is sold the transfer will be recorded in duplicate and the same process followed in each successive change of ownership. This will protect the buyer of a used car from purchasing a stolen automobile. The abstract will also be issued on cars now in operation where a clear title can be proved.

—

E. & W. Mfg. Co. in Production

MILWAUKEE, May 14—The E. & W. Mfg. Co., organized some time ago by Frank J. Edwards and George H. Williams to manufacture a 1- and 2-ton truck attachment for Ford and other makes of cars, is now in active production. Between 25 and 30 attachments are made daily.

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Storage Building for Kelsey Wheel

DETROIT, May 14—The Kelsey Wheel Co. is putting up a one-story storage building.

May Have Pig Iron Priorities

Sub-Committee of War Industries Board to Look Out for Government's Needs

NEW YORK, May 15—Preparations are under way for distributing the pig iron supply of the country on a priority basis so that the war needs of the nation may be met first. The work is in charge of the Sub-Committee on Pig Iron, Iron Ore and Lake Transportation of the War Industries Board. A circular letter, signed by H. C. Dalbon, chairman of the sub-committee, has just been sent to all producers of pig iron. The specific object of this circular letter is to make a careful canvass of the pig iron situation so as to enable the sub-committee to intelligently advise the Director of Steel Supply of the War Industries Board.

In the circular, information is asked from recipients regarding their orders on hand, purchasers of the iron, dates of delivery, estimated production for the balance of the year from May 1, any unsold balance, character of iron ordered, whether foundry, malleable or basic, or the percentage of each kind if all are produced. The furnace men are also requested immediately to make a canvass of their customers to determine the amount of iron they have on hand, their probable requirements for the balance of the year and what proportion of their product is directly or indirectly for government use.

Early in May a meeting of leading pig iron producers was held in Cleveland and this was followed by a conference with government officials at Washington. This led to the decision to gather information on which to base a rational system of distribution. As soon as this information is obtained it is the plan to issue a system of priorities covering the distribution of pig. Concerns which work largely on government orders will have their requirements met first. Those whose product contains only a small fraction of war requisites will receive attention next; they will get all the iron they need as soon as possible after the needs of the first class have been supplied. Finally comes the third class of consumers, those who produce for private consumption only. Among them will be distributed what remains after all requirements of firms engaged on war work have been met. The important question is what this surplus will be and what proportion it will bear to the normal requirements of the non-war industries.

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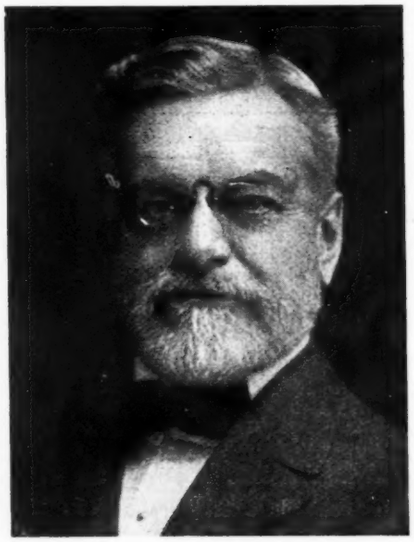
All Platinum Stocks Are Commandeered

WASHINGTON, May 15—All platinum, iridium and palladium held by refiners, some importers, manufacturing jewelers and large dealers have been commandeered by the Government. The price fixed for platinum is $105, iridium $175 and palladium $135 an ounce.

Frederick Remsen Hutton



NEW YORK, May 15—Frederick Remsen Hutton, Emeritus Professor of Mechanical Engineering in Columbia University and a prominent and active member of the Society of Automotive Engineers since 1908, died at his home, 257 West Eighty-sixth Street, in his 65th year on Tuesday, May 14.

Professor Hutton, who was secretary of the American Society of Mechanical Engineers for 24 years—from 1883 until 1907, when he was elected its president—was elected first vice-president of the Society of Automotive Engineers in 1915, and from 1910 up to the present time had been an active worker in the various divisions of the S. A. E. During the five years between 1910 and 1915 he was a member of the Library, Papers and Nominating Committees, and during 1913, 1914 and 1915 was chairman of the Publication Committee. During 1915 and 1916 he was a member of the Research Division, and it was under his supervision and guidance that standard methods of making fuel consumption and acceleration tests were made. He was recently appointed chairman of the Nomenclature Division and had just started work in this field.

Professor Hutton had been chairman of the Technical Committee of the Automobile Club of America since it was started about 6 years ago and in this position has had charge of the club's testing laboratory. He was one of the first engineers to consider the design of automotive vehicles and had a motor car in operation in 1900.

Professor Hutton was Dean of the Faculty of Engineering at Columbia University from 1899 to 1905 and had written extensively on engineering subjects. Among his better-known works are: "Mechanical Engineering of Steam Power and Plants;" "Heat and Heat Engines;" "The Gas Engine;" and "Mechanical Engineering of Steam Power Plants."

He was born in New York May 28, 1853, and was graduated from Columbia in 1873.

Inventions Section Created

As Part of General Staff of War Department Will Investigate New Ideas

WASHINGTON, May 11—An Inventions Section has been created as a part of the General Staff of the War Department to make prompt and thorough investigations of inventions of a mechanical, electrical or chemical nature. Inventions may be sent by mail or submitted in person together with written descriptions and drawings. They will first be examined by a board having technical experience with such inventions, and those with merit will be referred to the Advisory Board to be tested and considered for adoption.

The Advisory Board includes the following:

D. W. Brunton, member Naval Consulting Board and Chairman War Committee of Technical Societies; Dr. Graham Edgar, member National Research Council; Col. James W. Furlow, Quartermaster Department, Chief, Motors Division; Col. J. A. Hornsby, M. C., Chief, Hospital Division, Surgeon General's Office; Lt. Col. Morgan L. Brett, Ordnance Department, Engineering Branch; Lt. Col. Robert A. Millikan, S. C., Chief, Science and Research Division; Lt. Col. N. H. Slaughter, S. C., Chief, Radio Development Section; Major Joseph A. Mauborgne, S. C., Chief, Electrical Engineering Section.

In testing and developing inventions the Advisory Board will work with a number of agencies, including the following:

Research Council; Bureau of Standards; War Committee of National Technical Societies (this committee consists of two members detailed from each of the ten important technical societies in the United States); laboratories and shops of the Staff and Supply Departments of the Army; Patent Office, Aircraft Production Board; all Army Service schools; C. L. Norton, Massachusetts Institute of Technology, Cambridge, Mass.; Dr. Charles P. Steinmetz, General Electric Co., Schenectady, N. Y.; A. H. Beyer, Chairman, Committee on Testing Laboratory, Columbia University, New York City; R. R. Abbott, Metallurgist, Peerless Motor Car Co., Cleveland, Ohio; Dr. John A. Mathews, President, Halcomb Steel Co., Syracuse, N. Y.; Knox Taylor, President, Taylor-Wharton Iron and Steel Co., High Bridge, N. J.; Howard D. Colman, Barber-Colman Co., Rockford, Ill.; Preston S. Miller, Electrical Testing Laboratories, New York City; Herbert Fisher Moore, University of Illinois, Urbana, Ill.; L. F. Miller, Metallurgist, Mitchell Motor Co., Racine, Wis.; E. J. Okey, the Timken Roller Bearing Co., Canton, Ohio; Dr Alex Hrdlicka, curator, Division of Physical Anthropology; United States National Museum, Washington, D. C.

In order to submit an invention for consideration, test, sale or development, the inventor should with his letter give the name and object of the invention, claim for superiority or novelty, results obtained by the experiment, whether the invention is patented, if remuneration is expected, if the invention has been before any other agency and the number of enclosures with the letter. Written description and sketches or drawings of sufficient detail to allow full understanding of the cases should be submitted. If the invention is an explosive or chemical combination the ingredients and process of mixture should be stated.

The Inventions Section will not bear drawings or descriptions expense.

Industrial Review of the Week

A Summary of Major Developments in Other Fields

Steel Capacity in All Branches Is Plentiful

Steel capacity in all lines exists in plenty, but it is the specter of short fuel supply that is behind all the predictions of long-continued monopoly of steel output by the Government. Ingot production in April was at the yearly rate of 43,000,000 tons. A year at that rate would mean a very considerable surplus above war needs, direct and indirect.

Iron and steel jobbers have just presented their case at Washington. Theoretically their prospects of getting steel are fair, but priority difficulties are many. Already leading jobbers have fallen in line with steel makers and are requiring buyers to show war use of material called for.

Some manufacturers already know that their present stocks of pig iron or of rolled steel will not be replaced and they cannot turn quickly enough into war channels to avoid a shutdown.

While the concentration of pig iron and steel capacity on Government needs can be worked out for a time, the problems of the dislocations in consuming industries are not so easy, in particular the idleness for larger or shorter periods of considerable bodies of men.—*Iron Age.*

Bituminous Coal Supply Dependent on Railroads

The matter of a sufficient supply of bituminous coal in this country has never been simply a question of production. It is at all times a question of adequate transportation facilities.

Nothing proves this statement more conclusively than the showing made by the bituminous mines during the last two weeks, when record tonnages were produced. For the week ending April 27, owing to an improvement in the car supply, these mines shipped a total of 11,668,000 short tons.—*Coal Age.*

BUSINESS CONDITIONS AS REPORTED TO THE FEDERAL RESERVE BOARD

The following summary of general business conditions on April 23, 1918, is based on reports from the 12 Federal bank districts:

	District No. 1—Boston.	District No. 2—New York.	District No. 3—Philadelphia.	District No. 4—Cleveland.	District No. 5—Richmond.	District No. 6—Atlanta.
General business	Slightly quieter	Active	Active; stronger tone.	Good	Very satisfactory	Satisfactory.
Crops:						
Condition	Prospects good for large acreage.	Good	Good	Very fair	Prosperous; well advanced.	Do.
Outlook			....do	Favorable	Satisfactory, except labor.	Good.
Industries of the district.	Busy	Very busy, with Government work receiving preference.	All industries producing essentials are very busy.	Active	Active; profitably employed.	Fully employed.
Construction, building, and engineering.	Subnormal	Dull	Decreasing	Decreasing	Private building negligible; Government work active.	Inactive.
Foreign trade		Very much restricted.	Not as large as last year.		Limited by freight room.	Do.
Bank clearings	Increase	Increase	Increase	Decrease	Increase	Steady.
Money rates	Decreased	Firm	Very firm	Firmer	Good demand; 6 per cent; increasing.	Slight increase.
Railroad, post office, and other receipts.	Railroad, decreased; post office increased.	Post office, telegraph, and railroad receipts increased.	Decrease	Increase	Railroad, irregular; post office, volume large.	Steady.
Labor conditions	Scarce and well paid.	Labor scarce; wages increasing.	Very scarce; wages high.	Scarce and exacting.	Inadequate; unsatisfactory.	Fair.
Outlook	For increased production on war requirements.	Good	Good	Promising	Satisfactory and encouraging.	Good.
Remarks	Business in non-essentials quieter and manufacturers devoting themselves to war work.				Crop preparations well advanced.	

	District No. 7—Chicago	District No. 8—St. Louis.	District No. 9—Minneapolis.	District No. 10—Kansas City.	District No. 11—Dallas.	District No. 12—San Francisco.
General business	On sound basis; little speculation.	Good	Good	Good	Good	Active.
Crops:						
Condition	Excellent	....do		Generally good	Much improved	Excellent.
Outlook	....do	Favorable	Very favorable	Improved	Fair to good	Do.
Industries of the district.	Generally at capacity.	Active	Active	Active		Active.
Construction, building, and engineering.	Stagnant	Rather quiet	Slow	Farm building offsets lull in city building.	Building activity improved, and good prospects normal spring activity.	Reduced.
Foreign trade					Satisfactory, only hampered by export space.	Increasing.
Bank clearings	Increase	Increase	Little change	Large increase	Increase	Do.
Money rates	Quite firm	Firm	Steady	Firm	Steady; no change	Firm.
Railroad, post office, and other receipts.	Increase	Increase in postal receipts.	No change		Railroad receipts above last year; Post-office increase.	Increasing.
Labor conditions	Labor scarce, consequently independent.	Still rather unsettled, but improving.	Fair to good	Adjusted and settled.	Scarcity in all branches; wages advancing.	Improving.
Outlook	Good	Promising	Favorable	Good	As satisfactory as could be expected under war conditions.	Favorable.
Remarks				The general improvement of the crop prospects has affected the betterment of all business condition.	Rains in drought sections have made improvement, and reports are encouraging: business good; outlook promising.	

Many Factory Additions Mark Production Increase

DETROIT, May 13—The General Motors Co. is adding a 1-story building to its Cadillac plant.

—

Extension for Michigan Copper

DETROIT, May 13—To the plant of the Michigan Copper & Brass Co. has been added a recently completed 1-story mill building. This will give an added floor space of 66,240 sq. ft.

—

New Factory for Dafoe-Eustice

DETROIT, May 13—The Dafoe-Eustice Co., manufacturer of canvas and leather specialties, will begin production to-day in its new 4-story factory, which was just completed. Accommodations for a force of 1000 employees are provided. The building covers an area of 140 x 200 ft., and practically the entire capacity is to be devoted to government contracts.

—

Boiler House for Paige-Detroit

DETROIT, May 13—The Paige-Detroit Motor Car Co. will erect a 1-story boiler house building on its factory site.

—

Racine Auto Top Addition

RACINE, WIS., May 14—The Racine Auto Top Co. has started the erection of a factory addition. This will be 62 x 187, and will be ready before the end of the year.

—

Milwaukee Die Cast Bearings Addition

MILWAUKEE, May 14—The Milwaukee Die Casting Co. is erecting a large addition to its shops, to be used for the manufacture of die-cast bearings.

—

Universal Machinery to Start New Plant

MILWAUKEE, May 14—The Universal Machinery Co., manufacturer of machine tools, will start work in about 10 days on the first unit of its new plant here. The first building in this will be a brick and steel foundry with a 2-story machine shop attached.

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Wisconsin Motor to Add

MILWAUKEE, May 14—The Wisconsin Motor Mfg. Co. is building a large addition to the administration building of its main plant at Forty-fifth and Burnham Streets, West Allis, Wis.

—

New Factory for Globe Machine

CLEVELAND, May 14—The Globe Machine & Stamping Co. has been granted a permit to erect a 4-story manufacturing and storage building, 312 x 92 ft.

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Die Firm to Have New Factory

TOLEDO, May 14—A new factory is being erected for the Toledo Tap & Die Co. The building will be 200 x 50 ft., and 1 story high. Machine tools, taps and dies will be made. The factory will be ready to begin operations about July 1.

The company was organized 6 months ago by Robert E. Ellery.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

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To Enlarge Lane Truck Factory

KALAMAZOO, MICH., May 13—The plant of the Lane Motor Truck Co. will be greatly enlarged to take care of Government contracts and to increase the capacity for the manufacture of standardized trucks. The company has installed a special department to manufacture all of its cushions and curtains, and will open several other departments to do work which in the past has been done in other parts of the country.

—

Curtis Tool to Enlarge

FOND DU LAC, WIS., May 14—The Curtis Tool Co., organized last year to manufacture tools, dies, jigs and fixtures for metalworking plants, has moved to larger quarters in the Hass Industrial Bldg., and has increased its working force 30 per cent.

—

Capital Increase

The Newark Stamping & Foundry Co., Newark, Ohio, has increased its common stock from $35,000 to $50,000 and preferred stock from $15,000 to $25,000.

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Dividends Declared

The Maxwell Motor Co., Inc., Detroit, has declared a regular quarterly dividend of $1.75 a share on the first preferred stock, payable in first preferred dividend certificates deliverable July 1 to holders of record at the close of business June 14. Certificates will be dated July 1, 1918, and are due July 1, 1920, with interest at the rate of 6 per cent per annum payable semi-annually. They are subject to redemption at the option of the company at their face value, together with the interest thereon.

Three months ago the dividend on this issue was also declared in scrip.

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The Auto Sales Corp. has declared an initial dividend of 1 per cent on its preferred stock, payable May 15 to stock of record May 10.

—

The Continental Motors Corp., Detroit, has declared a 1½ per cent dividend, payable May 25.

Menominee Discontinues Two Models—Adds New One

MENOMINEE, MICH., May 14—The Menominee Motor Truck Co. has discontinued the manufacture of its ¾-ton Model EW, and its 1-ton Model FW, and a new truck styled the "Hurryton" is being made. This has a capacity of 1-ton, a 130 in. wheelbase, and will sell for $1,775. The truck will have a Continental engine, 3 crankshaft bearings, 3¾ x 5, a thermo-syphon cooling system, and cylinders cast in block. The horsepower, S. A. E. rating, is 22.5.

Other features of the chassis include high tension Eisemann magneto, with manual spark advance; Stromberg carbureter; gravity fuel tank under seat; multiple disc clutch and transmission in unit with a motor built by Fuller & Sons; 3 speeds forward and reverse; Timken worm drive rear axle, ratio 7 to 1; Tuthill Titanic springs; Spicer joints; radius rods, and Gemmer steering gears.

The chassis is fitted with 34 x 4½ front and 34 x 5 rear solid tires.

—

Addition for Allen-Bradley

MILWAUKEE, May 14—The Allen-Bradley Co., manufacturer of rheostats and other electric controlling appliances, will erect a 2-story addition to its plant within a few months.

—

Oil Company Moves Office

DETROIT, May 15—The Bound Brook Oil-less Bearing Co. has moved its western office from the Moffat Bldg. to the Ford Bldg. Harry J. Lindsley, western sales manager of the company, is in charge.

—

Moon to Make Shells for Government

ST. LOUIS, May 14—The Moon Motor Car Co. has received a Government contract to manufacture shells at the rate of 1000 a day. Production will start in 3 months. The company will start immediately on the erection of a new building for the work. The contract totals more than $2,000,000.

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Drive-Away From Sterling Factory

BALTIMORE, May 14—A drive-away of 30 Class B trucks, assembled by the Sterling Motor Truck Co. of Milwaukee arrived here last week after a 2-day trip from the factory. The convoy was in charge of Captain Brunson and his company of 86 men, who were at the Sterling plant for 3 weeks to study the construction and maintenance of the trucks.

—

Holley Company Changes Style

DETROIT, May 14—The corporate style of the Holley Kerosene Carburetor Co. has been changed to the Holley Carburetor Co.

Fiat Designs New Body

No Great Changes Mechanically—Car of Interest as Example of General Tendencies

By W. F. Bradley

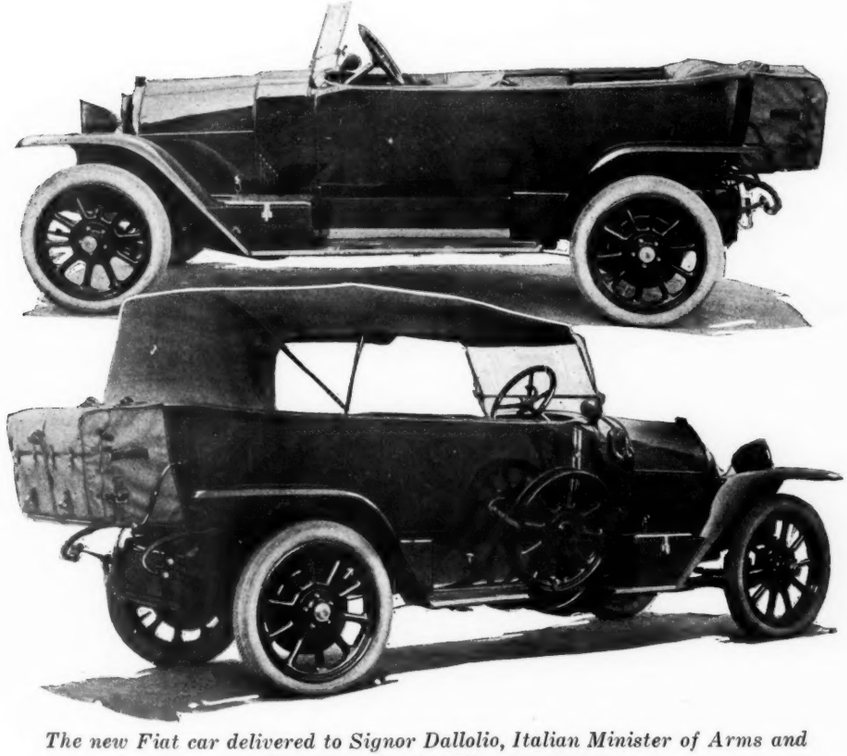
PARIS, FRANCE, April 10—As an example of European tendencies in car and body styles the automobile recently delivered by the Fiat company to Signor Dallolio, Italian Minister of Arms and Munitions, is of general interest.

Mechanically there are no great changes in the chassis, which has a 4-cylinder block engine of 100 x 180 mm. bore and stroke, a 4-speed gearset and spiral bevel rear axle. An electric lighting set is fitted, with belt-driven dynamo, but there is no electric starter. The storage batteries are carried on the right runningboard, the box being shaped to fit the front fender. This is becoming a favorite European position, for it makes the batteries completely accessible and reduces the length of wiring. Fiat seems to have adopted this position for all its post-war cars. On the left runningboard there is a corresponding metal box with trays for carrying tools.

The straight line effect sought in the body is obtained by building the cowl with very little slope and making the top rail of the body practically straight. The fenders are domed slightly, but do not follow the contour of the wheels; they are kept straight in order to enhance the straight line effect. The one-man top completely disappears into a cabinet back of the rear seats, a feature that has been very successfully worked out with a view both to neatness and practicability. The rear seat is divided. There is a deck back of the front seats, and under this a cabinet containing three folding tables with drawers for thermos bottle, maps, etc.

Storm curtains make it possible to transform the car into a completely closed vehicle, there being a close fit between the top and the windshield and the forward side curtains being brought round the edges of the latter. Head and side lights are combined.

Inside are electric lights for the driver's compartment, for the tables in the rear compartment, and also a roof light. A big capacity baggage rack is mounted at the rear. Wheels are the Sankey detachable steel-spoke type equipped with 34 x 4½ clincher tires.



The new Fiat car delivered to Signor Dallolio, Italian Minister of Arms and Munitions, by the Fiat company

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To Co-ordinate Labor Activities

WASHINGTON, May 13 — Felix Frankfurter of Harvard University has been appointed administrator of war labor activities under Secretary of Labor Wilson. Mr. Frankfurter will co-ordinate the labor activities of all government departments having to do with the production of war materials. Heretofore these departments have operated separately and competitively in obtaining labor supply and making wage awards.

Mr. Frankfurter has been serving as assistant to the Secretary of War. He returned recently from England and France where he made an investigation of labor conditions and problems.

Japan Subsidizes Cars

Government Will Pay Definite Sum to Purchasers and Users of Motor Vehicles

TOKIO, JAPAN, April 9—The Government of Japan is to help its citizens buy American motor cars and trucks by granting them a purchasing subsidy of not more than $500, and in addition an annual maintenance subsidy for 5 years not to exceed $150. In return these cars may be collected by the Minister of War for military service when needed. Each car or truck, in order to qualify, must have a carrying capacity of at least 2240 lb.

The Diet in Tokio recently passed the military motor car subsidy law, and it was at once promulgated by the Emperor; the Premier, Count M. Terauchi, and the Minister of War, Mr. K. Oshima.

Besides encouraging the buying of imported cars the law offers inducements to the Japanese to make such cars. A manufacturing subsidy of $1,000 or less is to be granted for the cars that qualify when these are made by Japanese or Japanese-owned corporations having their factories in the Empire.

There are now 3 companies in Japan classed as automobile manufacturing organizations. Furthest advanced is the South Manchuria Railway Co., which, at Dairen, has built a factory and turned out 4 cars, which are now being subjected to experimental tests. The two largest shipbuilding companies in Japan are now erecting automobile factories. The Mitsubishi Dock Co. will construct airplane engines as well as cars at Nagasaki, and the Kawasaki Dock Co. will build motor cars at Kobe. In addition, the Japan Car Works, Nagoya, is assembling cars, all the important parts of which have been imported from America.

In time of war, when the cars have been collected and are in military service, their owners are to be given a certain compensatory amount of money by the Minister of War.

Subsidized cars may not be exported, sold or rented to foreigners, and may not be given as security. Frequent inspection of the cars by mechanics of the War Department will detect faults, which will be ordered corrected within a certain period. Should the repairs not be made on time the owners will be disqualified and their right to the subsidy will be suspended.

A supplementary article of the law says: "A person who possesses foreign-made motor cars which have a capacity equal to that of the motor cars qualified by the law, and who uses the cars himself or allows a third person to use them, shall be granted a subsidy of not more than $500."

In Japan horses are scarce, and most of the trucking is done by boys who pull 2-wheeled carts without sideboards.

Labor is in strong demand now in Japan, and the use of American trucks would release thousands of these youths for service in factories instead of on the streets. The purchase of motor trucks is profitable in Japan, and with the new subsidy it is expected that a good field for American trucks will open up, especially in Tokio and Osaka.

The sale of passenger cars also will be promoted. The open car is a rarity in Japan at present because of the wind and dust. The glass-enclosed car is used almost entirely.

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Bunting Brass Erecting Addition

TOLEDO, May 13—The Bunting Brass & Bronze Co. is adding a foundry to its plant. This will be completed within 60 days, and will contain 40 brass melting furnaces. The building will have a capacity of 40,000 lb. of bearing brass a day. Several government contracts have been received, and the company is making bearings for airplanes, submarines, destroyers, tanks and gun mountings.

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Says Highways Should Be 24 Feet Wide

DETROIT, May 13—George C. Diehl, chairman of the Good Roads Board of the American Automobile Assn., in an address before the Detroit Automobile Club last week advocated the building of more highways, none of which should be less than 24 ft. in width. For this purpose, Mr. Diehl said, state lines should be disregarded and legislators should think beyond the limits of towns, counties and even states.

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To Sell Herz Products

NEW YORK, May 13—The Pro-Mo-Tor Corp. has been formed for the purpose of exploiting the products manufactured by Herz & Co., New York. The new company will organize an advertising and selling campaign, and has elected officers as follows: President, Russel A. Cowles, president of the Ansonia Clock Co.; vice-president and general manager, Gustave L. Herz; treasurer, Edward S. Rothschild, president of the Public National Bank of New York, and secretary and counsel, Mark Eisner, United States Collector of Internal Revenue of New York.

Ohio Speeds Tractor Delivery

Plan Devised to Have Fordson Machines Shipped in Carload Lots

COLUMBUS, OHIO, May 14—The plan of the Bryant Tractor Co. in the distribution of Fordson tractors in Ohio is to enlist the services of citizens and dealers, the latter consisting chiefly of Ford agents, and have them finance a carload of the tractors in their respective communities.

Tractors cannot be shipped in less than car lots of seven, and the dealer taking and financing this quantity speeds up the delivery considerably. The orders which are sent directly to the distributer from farmers usually average one, two or three to a community. The dealers also take a few Fordson service parts in addition to the selected stock. These amount to $200, the sum being included with the tractor.

The responsibility and expense of unloading is assumed by the Ford dealers but is charged back to the user on delivery. This amounts to $15 a tractor including freight. Since the recent demonstration the Bryant Co. gave in Columbus it has received cash and certified checks covering more than 50 carloads of tractors. In addition the company has received payment for fifteen more carloads. This makes a total of about $400,000 worth of business covering tractors, plows, parts, etc., in little more than 2 weeks.

Practically all this business has been secured without the buyer ever having seen the tractor. Distribution throughout the state has been fairly well equalized.

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New Thrift Campaign Inaugurated

WASHINGTON, May 13—The Council of National Defense is inaugurating a campaign of thrift, directions of which are "do not buy anything you can do without." The campaign is not primarily to save money but to curtail consumption. It is supplementary to the efforts of the War Industries Board to curtail production in the less essential lines and is expected to operate automatically to relieve the manufacture of the less essential commodities. An effort was made by the Advisory Commission of the Council to determine non-essentials but the only ones everyone agreed upon were poker chips and artificial flowers. Automobiles were discussed but it was decided that in too many instances an automobile is a necessity.

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Locomobile Adds to Surplus

BRIDGEPORT, CONN., May 14—The Locomobile Co. of America increased its profit and loss surplus from $1,585,903 on March 31, 1917, to $2,086,036 a year later. Assets of the company were also increased from $15,218,431 to $17,660,530, most of the increase being in additions to machinery and equipment and merchandise, material and stock in process of manufacture.

Current assets of the company on March 31 amounted to $11,965,786 and current liabilities to $6,688,572, leaving a net working capital of $5,277,214.

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Case T. M. Extra Payment Plan

RACINE, WIS., May 13—The J. I. Case T. M. Co. has adopted an extra payment plan for all employees except those receiving more than $2,500 a year. All workers included in the plan will receive an extra payment of 10 per cent of his earnings for the year, payable at the rate of 2½ per cent quarterly. New employees who enter the service of the company during the first month of any quarter will participate in the payment for that quarter.

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Lee to Address Cleveland S. A. E.

CLEVELAND, May 10—Robert B. Lee of the Spery Gyroscope Co. will give a talk on "Useful Occupations of the Gyro" at the next meeting of the Cleveland section of the S. A. E., to be held May 15 at the Statler Hotel. He will also speak on searchlight and aeronautic instruments not gyroscopic in nature, which will be illustrated by a reel of aeronautic pictures.

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To Make Fabric for Tire Factories

TOLEDO, May 14—The Tower Textile Mfg. Co. has received more than $1,000,000 worth of government contracts. Some of these are canvas belts and fabric for Akron tire factories. The factory is only partially completed, but will be in operation by July 15.

Calendar

RACING

May 16—Uniontown. Uniontown Speedway Assn. Universal Trophy Race.
May 30—Avon, N. Y. Community Race.
May 30—Sheepshead Bay, N. Y. Championship races. Harkness Trophy.
June 22 — Chicago. Chicago Speedway.
July 4—Cincinnati. Cincinnati Speedway.

ASSOCIATIONS

May 13-18—Cleveland. War Convention of Machinery, Tool & Supply Industry of the United States.
June 3-4 — Chicago. National Gas Engine Assn. Eleventh Annual. Hotel Sherman.
June 5-12—Hot Springs, Va., National Assn. Automobile & Accessory Jobbers.
June 17-19—Dayton, O., Society Automotive Engineers, Annual Midsummer Session.

SHOWS

Sept. 23-28—Chicago, National Accessory Show for Fords. Coliseum.

ENGINEERING

June 26-28 — Buffalo, N. Y. American Society of Heating and Ventilating Engineers.
Sept. 2 — Cripple Creek, Colo. American Institute of Mining Engineers.
Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg. 29 West 39th Street.

CONVENTIONS

May 16-18—Philadelphia. "Win the War for Permanent Peace." Auspices of League to Enforce Peace. Bellevue - Stratford Hotel.